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Appendices

A. Report of the Entomologist.

B. Report of the Plant Pathologist.

C. Port Herald Experimental Station.

D. Zomba Experimental Station.

E. Lilongwe Experimental Station.

F. Mlanje Experimental Station.

G. Domira Bay Experimental Station.

H. Agricultural Statistics.

I. Native Tobacco Board Statement of Receipts and Payments, 1935.

Report of the Director of Agriculture.

PART I.—Agriculture in Nyasaland.

Weather Conditions.

The weather conditions during the season 1934-35 throughout Nyasaland may be regarded as abnormal, particularly from the point of view of a high incidence of rainfall over certain periods and the length of the mid-season drought period.

The season opened in October with good rains and normal temperatures in most parts of the Southern Province which were propitious for nursery work and the grazing of cattle. The rainfall in parts of the Cholo tea belt, however, was much lower than normal but was offset by the total rainfall for the previous six months which was well in excess of normal. Weather conditions during November were generally good and were followed by fair average conditions in December. A few localities in Cholo and Zomba suffered from a higher rainfall than normal which led to abnormal soil erosion and leaching of plant food. Good plantings and sowings were general in central areas during the second half of December.

January in most southern areas was characterized by low temperatures and rainfall in excess of normal. Much of Cholo, Mlanje and south central areas, however, experienced good average conditions, and the weather in all northern areas was particularly good. January opened quite well in north central areas but a spell of dull weather with heavy rains in many parts started on the 8th and continued to the 19th.

There was a wide divergence from the normal rainfall during February over many parts of the country. The rainfall in the Mlanje tea belt was much in excess of normal and temperatures lower than normal were not conducive to good growth of crops. The total rainfall in Cholo and Zomba was about normal, but in the latter case most of the rainfall fell in the first ten days of the month, a fall of over three inches being encountered in one day. The drought period started towards the middle of February and lasted well into March over southern and central Nyasaland, exceptions being the Cholo highlands and the Mlanje tea belt. Useful showers fell during the drought period in Lower River areas.

It is advisable at this stage to review the conditions during the mid-growing season in the dark tobacco and contiguous areas on account of the great anxiety which was felt and in view of the good food and tobacco crops which were subsequently harvested. The experience of a long dry period extending in certain areas to five weeks should be remembered if and when such conditions are repeated in future years.

Early growth of crops was retarded somewhat by the low temperatures and lack of sunshine, but at this stage in the growth of tobacco such conditions are not so detrimental as later in the season. Replanting went on and much improvement was noticed towards the end of January. February and early March were characterised by a short rainfall, but, when normal conditions in the dark tobacco areas of the United States are studied, the weather during this period cannot be considered as detrimental to root development and to growth which subsequently was accelerated by the high temperatures and the rains of the middle of March. The contention that a dry February is infinitely preferable to a month of excessive rainfall was well upheld.

The total rainfall of March and April was generally about normal with temperatures slightly in excess of normal during the day. Such conditions were of great help in the development, ripening and curing of the remainder of the tobacco crop. To sum up, the season cannot be said to be in any way inferior to those of the past five years, a conclusion which was borne out by the yield and quality obtained. A comparative statement of the rainfall over ten-day periods during the season in the Northern Province and of similar rainfall in Maryland is of interest at this time.

1935		Fort Manning	Lilongwe	Likuni	Chimvua	Mpale	Dowa	Kasungu	Dedza
Jan.	1-10	2.24	1.78	2.42	4.42	3.34	5.75	4.35	4.82
	11-20	1.65	3.26	3.75	2.73	3.62	4.24	3.46	5.61
	21-31	1.82	1.89	2.16	2.19	3.70	2.06	1.16	2.07
Feb.	1-10	2.89	.60	.68	2.46	.46	1.11	.76	3.11
	11-20	.13	.40	.26	.20	1.91	.74	3.79	.34
	21-28	.33	.02	.06	0	.15	.30	.99	.84
Mar.	1-10	0	0	0	0	.38	.35	.13	.10
	11-20	2.44	1.28	1.94	2.62	.23	2.44	.68	3.45
	21-31	5.19	.48	2.55	2.49	2.33	1.70	.68	3.45

Upper Marlboro, Maryland.

		1923	1924	1925	1926	1927
May	21-31	0	2.10	1.13	.09	.57
June	1-10	.93	2.71	0	1.04	0
	11-21	1.58	1.11	.04	.52	3.25
	21-31	.48	1.38	1.73	.89	.34
July	1-10	.97	1.08	2.83	1.56	.48
	11-20	1.62	.03	.32	2.56	.60
	21-28	1.13	.68	3.35	.65	.33
Aug.	1-10	.70	.86	1.12	.54	.07
	11-20	1.71	2.15	.85	3.70	2.43
	21-31	.45	1.72	.65	2.37	3.06

To the north of the Dowa and Kota Kota highlands the drought period did not supervene and normal rainfall was experienced during February and March over most of these areas.

Total rainfall during March in the Southern Province was generally higher than normal; the greater part of the rain fell in the latter half of the month and abnormally heavy falls amounting to over four inches in a day were experienced. The total rainfall measured in Zomba was with one exception the highest ever recorded for that month. Lower river areas were fortunate in having a fair rainfall during March.

In the drier zones the rainfall during April, with the exception of localised downpours at the beginning of the month, may be said to have been ineffective as far as crop growth was concerned. In Lower River areas rainfall during April was somewhat above normal with an uneven distribution. Rainless spells of two weeks were met with in certain localities. Temperatures were about nominal everywhere with the exception of the tea belts where night temperatures were generally below normal, but the tea belts experienced good average rains from now on until the conclusion of the tea year.

To sum up the weather conditions over Nyasaland, it may be said that they were generally good for crop growth in more northerly areas, in the tea belts and in lower River areas. Elsewhere conditions caused anxiety for some time but the final results in areas below 2,500 ft. were quite fair. The crops in the dark tobacco belt turned out to be good, but at similar elevations in wet regions such as those of the Shire highlands, the crops were below normal.

The totals of rainfall for the six wet months and the six dry months for various localities are shown in the accompanying table.

	Zone	SEASON 1934-35 Total rainfall November 1, 1934 to April 30, 1935 Inches	Normal for six wet months Inches	Total rainfall May 1 to October 31, 1935 Inches	Normal for six dry months Inches
Port Herald	A	34.19	29.1	2.65	3.6
Port Herald Experimental Station		36.63	2.88	2.64	3.2
Chikwawa ...	...	26.23	29.7	1.98	2.3
Cholo	B	55.28	48.8	8.00	8.1
Makwasa ...	...	51.65	46.8	6.01	4.4
Nsikisi ...	...	51.46	42.4	6.40	7.8
Nchima ...	...	51.09	—	8.07	—
Mikundi ...	...	56.02	—	n.r	—
Masambanjati	...	n.r	—	10.43	—
Mlanje	C	67.19	66.6	10.55	14.5

n.r. = No record.

SEASON 1934-35.

	Zone	Total rainfall November 1, 1934 to April 30, 1935 Inches	Normal for six wet months Inches	Total rainfall May 1 to October 31, 1935 Inches	Normal for six dry months Inches
Chitakali ...	...	79.05	65.5	16.02	12.1
Thornwood ...	...	81.24	67.8	11.65	11.6
Ruo	...	63.16	53.7	10.34	6.3
Glenorchy ...	...	63.55	56.2	11.26	10.1
Sayama ...	...	67.64	56.0	9.67	10.5
Lujeri ...	...	80.17	76.3	13.65	14.3
Chisambo ...	...	82.04	—	16.13	—
Nalipiri	D ...	58.74	51.9	9.83	11.0
Blantyre	E ...	51.53	39.9	2.76	3.3
Chingaluwe	...	47.42	42.8	4.52	3.3
Nyambadwe	...	42.90	39.0	3.28	2.9
Chiradzulu	...	45.24	40.0	n.r	2.5
Nyungwe ...	...	34.50	—	.50	—
Michiru	F ...	33.07	35.3	.61	2.0
Namalanga	G ...	25.11	29.9	2.94	1.0
Nasonia ...	...	46.03	36.9	5.42	1.9
Zomba Experimental Station	H ...	59.66	46.8	2.02	4.6
Likwenu ...	...	57.69	—	.81	—
Police Headquarters	...	54.22	41.9	2.73	1.8
Domasi ...	...	60.76	52.7	n.r	—
Nankunda ...	...	70.04	—	3.12	—
Malosa ...	...	59.06	—	n.r	—
Mbidi	I ...	48.11	35.8	n.r	1.5
Makwapala Experimental Station	...	51.92	34.0	1.11	1.5
Mwanza	K ...	31.51	37.2	2.63	.6
Liwonde	L ...	36.88	31.7	.32	1.1
Utale ...	...	39.92	31.5	n.r	.8
Bilila ...	...	33.68	28.0	.40	.7
Mandimba	M ...	62.34	34.0	n.r	.3
Namwera ...	...	47.06	42.2	.86	.3
Chipunga ...	...	46.67	35.0	.82	.8
Fort Johnston	N ...	26.15	29.4	.24	1.2
Monkey Bay	...	26.98	29.2	—	.9
Malindi ...	...	39.37	—	.27	—
Golomoti ...	...	33.74	29.5	n.r	.1
Ncheu	P ...	36.61	37.0	.61	.9
Mpamadzi ...	...	37.04	36.5	.75	.8
Likuni	S ...	31.25	32.9	.85	1.5
Chimvua ...	...	30.35	—	.13	—
Lilongwe ...	...	30.35	32.7	.67	.8
Nathenje ...	...	27.59	—	n.r	—
Mpali	T ...	24.43	—	n.r	—
Dowa ...	...	32.17	33.1	.49	.7
Fort Manning	...	37.58	39.8	.60	2.5
Domira Bay	U ...	28.37	31.0	.30	.1
Dedza	V ...	39.81	39.7	1.33	2.2
Kasungu	X ...	31.19	29.1	n.r	.3
Mzimba ...	...	31.62	31.7	.22	.2
Kota Kota	Y ...	38.44	48.2	1.80	2.0
Chinteche	Z ...	62.16	62.9	5.20	5.1
Livingstonia	...	63.63	57.5	6.34	6.2
Vua ...	...	26.11	32.5	n.r	1.2
Karonga ...	...	33.41	52.3	1.51	2.8

It is not out of place to remark on the high level of Lakes Nyasa and Malombe. Indeed, the latter has become so high that water plants have died off and the lake now presents a large sheet of water where in 1930 was a succession of large pools. Much agricultural land has been submerged by the rise of both lakes and valuable rice land has been put out of use.

Production and Export.

European production and acreages of the principal crops over the past three years are shown in the following table.

	1933		1934		1935	
	Acres	Yields	Acres	Yields	Acres	Yields
Tea	13,830	3,049,760 lb.	15,414	4,449,312 lb.	16,054	5,730,704 lb.
Coffee	1,210	1,128 cwt.	1,188	1,039 cwt.	995	1,605 cwt.
Tobacco	7,862	3,488,016 lb.	8,350	3,895,136 lb.	6,144	2,112,096 lb.
Sisal	9,785	—	9,785	—	9,785	—
Cotton (lint)	246	682 cwt.	1,501	2,451 cwt.	2,067	2,016 cwt.
Rubber	1,500	—	1,300	—	1,300	159,936 lb.

Native production and numbers of growers of the two principal cash crops, viz., cotton and tobacco, are shown below.

	1933		1934		1935	
	No. of growers	Amount sold	No. of growers	Amount sold	No. of growers	Amount sold
Cotton (seed cotton) ...	26,242	3,080 tons	28,970	5,377 tons	70,199	11,237 tons
Tobacco	56,026	4,077 tons	60,247	5,054 tons	49,529	4,594 tons

Cotton growers refer to Crown land only; figures of private estate (tenant) growers are not known.

The exported amounts and values of the various items of agricultural produce and of raw materials are given for the past three years in the table that follows.

	1933		1934		1935	
	Amount	Value £	Amount	Value £	Amount	Value £
Capsicums and chillies ...	16,633 lb.	208	41,398 lb.	517	47,869 lb.	598
Coffee	357 cwt.	833	366 cwt.	688	603 cwt.	1,127
Maize and maize flour ...	39,454 lb.	44	300,000 lb.	335	20,185 lb.	23
Potatoes	125,397 lb.	671	98,858 lb.	451	113,960 lb.	477
Tobacco	10,394,498 lb.	389,794	12,544,126 lb.	470,405	10,168,641 lb.	296,929
Tea	3,276,477 lb.	59,656	4,624,111 lb.	171,470	6,042,532 lb.	223,876
Beeswax	240 cwt.	1,348	197 cwt.	1,104	92 cwt.	445
Cotton (lint)	1,082 tons	50,014	1,851 tons	102,876	3,658 tons	204,850
Cotton seed	616 tons	1,232	3 tons	6	1,183 tons	2,366
Fibre (all kinds)	20 tons	162	435 lb.	2	355 lb.	1
Groundnuts	253 tons	1,519	214 tons	1,068	20 tons	103
Rubber	71,955 lb.	300	22,041 lb.	92	131,760 lb.	549
Strophanthus	17,521 lb.	2,628	9,610 lb.	1,441	9,646 lb.	964
Rice	2,438 lb.	11	3,106 lb.	14	250 lb.	1

The most notable increases of exports during 1935 were in tea, cotton, cotton seed and rubber. In the case of tea, the increase of a fraction over 30 per cent. was due to improved yields per acre, the restoration of prices to the 1934 level, and the coming into bearing of new acreages. Cotton production was doubled in 1935 and a further increase of production is anticipated in 1936. Export of cotton seed was made possible by improved home prices while rubber tapping on Nyasaland's only rubber estate was resumed in early 1935 after the rubber restriction scheme came into force. Cotton seed, however, was the only oilseed which was exported in quantity. The year under review was, on the whole, more favourable to exporters of groundnuts and soya beans for sale in Europe than 1934, but Nyasaland is no more in a position to export these commodities on a large scale than it is to be regarded as a regular exporter of maize and rice.

The average prices paid for native tobacco were higher than in 1934, especially in the Northern Province, but cotton prices remained low. Low prices are damaging to the economic position of a country when they cause decreased production, and on that account it is pleasing to be able to record not only the maintenance but an increase of cotton production. Unlike native dark tobacco, cotton is not exposed to the danger of production outpacing demand or consumption but it is exposed to the danger of a fall in prices which may result from the difficult cotton situation in the United States of America. Under present conditions, however, the risk must be taken. The production of native dark tobacco continued to be controlled in amount according to market conditions, and the prices obtained by growers could not be said to be uneconomic from the native point of view.

Tobacco.

The total figures of tobacco production for 1935 show in comparison with the figures of the previous year a decrease which was due partly to unfavourable climatic conditions and partly to the market. The actual figures are given in the following table along with the 1934 figures.

Production

	1934		1935	
European	lb.	lb.	lb	lb.
Flue-cured ...	2,667,728		1,492,400	
Fire-cured ...	872,928	3,895,136	497,392	2,112,096
Air-cured ...	354,480		122,304	
Native				
Fire-cured ...		11,320,717		10,291,560
		15,215,853		12,403,656

The decrease in production was reflected in a decrease of exports.

Exports

	1934		1935	
	Amount lb.	Value £	Amount lb.	Value £
Flue-cured ...	1,933,259	72,497	1,020,107	29,980
Fire-cured ...	9,744,154	365,406	8,704,943	254,012
Air-cured ...	866,713	32,502	443,591	12,937
	12,544,126	470,405	10,168,641	296,929

At the end of 1935, stocks of Nyasaland tobacco stood at 29,817,324 lb., a $2\frac{5}{12}$ years' supply on the usual basis. Consumption of Nyasa tobacco in 1935 amounted to 12,525,115 lb., an increase of 1,647 lb. over 1934 and 82.2 per cent. of all Empire growths. The latter figure compares with 30.2 per cent. for 1934. The 1935 exports of tobacco totalled 10,168,641 lb. as against 12,544,124 lb. in 1934, and there was an excess in deliveries over imports into the United Kingdom of 2,404,998 lb. It is thus apparent that the point of production of both bright and dark tobacco was on the safe side and that stocks are likely to be reduced in 1936.

European.—Acreages and yields are given by districts in appendix H. The crop was disposed of as follows.

	Flue-cured lb.	Fire-cured lb.	Air-cured lb.	Total lb.
Sold locally	1,233,120	406,672	122,080	1,761,872
Exported direct	161,952	34,720	—	196,672
Left on hand	97,328	56,000	224	153,552

In comparison with 1934 the figures are as follows.

	1934 lb.	1935 lb.
Sold locally	2,635,584	1,761,872
Exported direct	429,968	196,672
Left on hand	829,584	153,552

European tobacco occupied 6,144 acres as compared with 8,350 acres in 1934. The state of the industry was such that Government found it expedient to give advances to planters, after the 1935 season and in preparation for the 1936 season, to enable them to prepare their nurseries, and it may therefore be concluded that the 1935 season was not financially favourable to European growers. Their plight has been recognised, and during the year under review much time was spent by Government and the Nyasaland Tobacco Association in the consideration of legislation which, by control of the industry, might enable the marketing of flue-cured tobacco surplus to local requirements to be done with advantage to the grower. Legislation was actually passed in early 1936, and it is hoped that the pool for surplus leaf which will be created under the ordinance will result in the finding of new outlets for flue-cured tobacco. It is also hoped that encouragement will be got from the report of the Imperial Economic Committee which is conducting an enquiry into the marketing of Empire tobaccos.

Native.—In the Northern Province the season, judged by the yield and quality obtained, was in no way inferior to previous seasons despite a five weeks' drought towards the end of the growing season which caused some anxiety. A good crop was harvested, and the experience of 1935 should be kept in mind when similar conditions arise in the future. The contention that a dry February is preferable to a month of rainfall was well upheld. Weather conditions in the Southern Province tobacco areas were detrimental to a good crop, and leaf of good body and texture was harvested only in parts of the Palombe valley and southern Zomba.

The average amounts produced per grower on Crown land were 210 lb. in the Northern Province and 206 lb. in the Southern Province. The numbers of registered Crown-land growers were respectively 29,227 and 6,729, these figures representing decreases of 24.1 and 23.4 per cent. in comparison with the 1934 figures. The amounts of dark tobacco purchased from native Crown-land and private-estate growers are given under provinces in the following table.

	Northern Province lb.	Southern Province lb.
Crown land	6,123,409 ...	1,383,723
Private estates	1,789,923 ...	994,505
	7,913,332	2,378,228

The total figure for the dark tobacco crop produced by native growers was thus 10,291,560 lb. The corresponding figure for 1934 was 11,320,717 lb.

The district details of Crown-land tobacco sold in the two provinces are given here. The figures for the 1934 crop are quoted for comparison and decreases and increases are shown.

NORTHERN PROVINCE

	1934 lb.		1935 lb.		lb.
Ncheu ...	143,970	...	146,785	+	2,815
Fort Manning	45,114	...	43,427	−	1,687
Dedza* ...	266,346	...	—	−	266,346
Lilongwe ...	2,932,346	...	3,435,957	+	503,611
Dowa ...	1,475,946	...	2,497,240	+	1,021,294
TOTAL ..	4,863,722	...	6,128,409	+	1,259,687

SOUTHERN PROVINCE

	1934 lb.		1935 lb.		lb.
Mlanje ...	1,271,064	...	641,381	−	629,683
Cholo ...	33,575	...	18,030	−	15,545
Blantyre ...	449,817	...	183,954	−	265,863
Chiradzulu ...	1,265,343	...	381,550	−	883,793
Zomba ...	272,969	...	128,615	−	144,354
Upper Shire...	42,100	...	30,193	−	11,907
TOTAL	3,334,868	...	1,383,723	—	1,951,145
GRAND TOTAL	8,198,590	...	7,507,132	—	691,458

The buying stations of the Native Tobacco Board in the Northern Province opened on May 27. Buying in the Southern Province commenced a few weeks earlier. Buying licences numbered 98 in all. The amounts purchased at the buying stations were as follows.

	lb.
Nsaru	1,644,220
Lombadzi	727,242
Nathenje	1,064,495
Mponela	2,497,240
	5,933,197

Purchases in the uncontrolled areas of Fort Manning and Ncheu amounted to 190,212 lb.

COTTON.

Native.—It has already been mentioned that the production of native-grown cotton increased largely in 1935. In fact, the crop was doubled. This result was brought about by propaganda in favour of the crop, the establishment of new seed depots and markets, and increased care in cultivation, all of which were made possible by adding the efforts of agricultural supervisors to those of the agricultural officers and by increasing the number of native instructors.

In the Lower River the crop amounted to 6,485 tons of seed cotton, an increase of 31 per cent. over the 1934 figure. In the central area of the Southern Province, the production was 1,429 tons as against 253 tons in the previous year, while in the area between northern Ncheu and Kota Kota production jumped from 175 to 1,774 tons of seed cotton. The production of cotton on Crown land, inclusive of 49 tons in North Nyasa, was thus 9,737 tons. Private estates accounted for 1,500 tons, and the total for the country was therefore 11,237 tons, a figure which compares well with the 5,377 tons of 1934. Export amounted to 20,485 bales; the 1934 figure was approximately 10,000 bales.

* Tobacco from Crown-land in Dedza is included in the Lilongwe returns for 1935.

The average price for No. 1 grade was 1.102d., for No. 2 .539d., and for No. 3 .370d. It is estimated that the sum of £89,555 was paid to Crown-land growers and that of that sum £80,066 was paid for No. 1 grade. The production factor per pound of seed issued was 7.4 in the Lower River, 6.3 in the central part of the Southern Province and 11.5 in the area of the northern extension of the railway from Ncheu to Kota Kota. The percentage of No. 1 grade in the Crown-land crop was 84.

Details of Crown-land and private-estate seed-cotton production by districts are as follows.

Southern Province	tons	Northern Province	tons
Lower Shire	3,776	Ncheu	361
Chikwawa	3,079	Dedza	560
Cholo	649	Dowa	1,166
Mlanje	383	Kota Kota	178
Central Shire	466	North Nyasa	49
Blantyre	148		2,314
Chiradzulu	23		
Zomba	23		
Upper Shire	135		
South Nyasa	241		
	8,923		

The present bulk seed supply is used under the different conditions of the various cotton-growing areas, and the time has come when consideration should be given to the need for control of seed supply by zones or areas. The matter was taken up during the year and it will be pursued during 1936 in consultation with the Cotton Specialist of the Empire Cotton Growing Corporation and the buyers and ginners.

European—European production of seed cotton amounted to 303 tons as against 368 tons in 1934.

Tea.

The tea industry continued to expand towards its limit of 17,700 acres under the restriction scheme. The acreage planted during 1935 was 654, and the total at the end of the year was 16,054 acres of which 8,580 acres were in Mlanje and 7,474 acres in Cholo. Production of tea rose from 4,449,312 lb. in 1934 to 5,730,704 lb. in 1935 while exports, as already noted, increased by 30 per cent. The acreage in plucking was 12,611. Final allocations of new acreages for planting were given in early 1935, and the industry is now busily engaged in consolidating its position in view of the approach of the end of the present five-year period of restriction in March, 1938.

Assistance was given to the industry in the investigation of the problem of poor fermentation of leaf from certain soils in the high-rainfall belt of Mlanje, but the difficulties have not yet been overcome. Experimental work on erosion and its control, fertilizing, pruning methods and degrees of plucking was continued, and results of investigation of tea seed storage, the causes of bent and twisted tap-roots and the common method of planting out one and a half year-old stumps were communicated to the industry and have subsequently been published in the form of a bulletin.

Coffee.

The European coffee acreage continues to shrink. Figures for the past three years are given below.

	Total acreage	Acreage in bearing	Production cwt.	Amount exported cwt.
1933 ...	1,210	... 618 ...	1,128	... 357
1934 ...	1,188	... 805 ...	1,039	... 366
1935 ...	995	... 732 ...	1,605	... 603

Judged by the production and export figures, 1935 would seem to have been a better coffee year than its two predecessors.

In the Henga valley 1,000 coffee seedlings and in the Misuku hills in North Nyasa 2,500 seedlings were distributed to native growers. The demonstration plots at Nchena-chena have served a useful purpose and have been a source of interest. In Cholo the state of the native coffee gardens is good. They number 73 and all are terraced. As far as early growth is concerned, the industry has made a promising start, but, in view of the state of the market and in view of the doubt that may be expressed regarding the general suitability of Nyasaland for coffee growing, particularly when the long dry season is borne in mind, rapid expansion of the industry cannot be recommended.

Tung Oil and Other Crops.

The European acreage under tung oil increased from 184 acres in 1934 to 341 acres in 1935, a fact which shows an increased interest in the crop. A beginning was made in the distribution of plants (*Aleurites montana*) to natives in the vicinity of headquarters so that the progress of the plants might be kept under easy observation. On the whole, it may be said that tung oil promises well in Nyasaland, and it is hoped that in it the country will find an alternative crop of value.

It seems that *Aleurites Fordii* requires more specialised conditions than *A. montana*, and *montana* is therefore more generally suited to areas with an elevation of 2,500 feet or less. On the Zomba Experimental Station, *montana* trees of three years of age gave an average among 97 trees of 4.7 lb. of fruit segments per tree. The spread of the trees varies from 8 feet to 23 feet, and, as there are records of an even larger spread in a few years, it seems that the close planting that is advocated in certain quarters may be a mistake. It is thought at the moment that 24 feet by 24 feet is a minimum distance and that under favourable soil and moisture conditions 30 feet by 30 feet is to be recommended.

It has been mentioned that production of rubber was resumed during the year under review, and towards the end of the year there was talk of the re-opening of sisal estates. The latter have been closed down for the past few years, and a rising market has naturally turned attention to a product which used to be exported in quantity.

In European hands there were 275 acres under chillies and capsicums, 1,209 acres under maize, 33 acres under wheat, 3,196 acres under legumes for food, fodder and green manures, 43 acres under oilseeds, 430 acres of fruit trees, and 14,875 acres of artificially established woodland.

Native Food Crops.

Maize, the staple food crop of the country, was normal in yield in the Lower River area with the exception of the district south of Port Herald, but was below the average in the remainder of the Southern Province and in parts of the Northern Province. The causes of shortage were locusts and drought. Millets did not suffer to the same extent. Beans and groundnuts were disappointing on the whole, and floods and locusts combined to reduce the rice crop. On the other hand, root crops, particularly sweet potatoes, were very good and provided a means of tiding over periods of shortage of cereals. Rosette disease of groundnuts was common, and control measures in the form of closer spacing and destruction of off-season plants are being advocated.

Pests and Diseases.

Locusts.—The climatic conditions of the 1934-35 breeding season were detrimental to hopper development on the whole. In the Lower Shire district south of Port Herald hopper bands of considerable size moved from bush country into cultivated areas during February and did damage to cotton and food crops; on the other hand, areas in which eggs were laid produced no hoppers, in other areas no flying swarms developed from the hoppers, and the mortality caused by the fungus disease (*Empusa grylli*) was very much greater than in previous years. Flying swarms were therefore fewer than before and by the month of July were reported only from the higher altitudes. During the colder months in the middle of the year, semi-solitary locusts were found under such conditions that it was concluded that dispersal of the swarm individuals took place on a greater scale than in previous years. The northerly movement from the Zambesi valley was repeated in August-October, and the first egg-laying was recorded in the Chikwawa district in mid-November.

These notes refer to the red-winged locust (*Nomadacris septemfasciata*). During 1935 only one record of the appearance of the migratory locust (*Locusta migratorioides*) was made, the affected district being Upper Shire. A full account of the 1935 locust situation will be found in appendix A. Credit must be given to the Entomologist and Mr. G. D. Hayes, who was in charge of locust work during Captain Smee's absence on leave, for the very full records which have been kept. There is in consequence a better understanding of the situation.

Crop Pests.—Owing to leave and locusts, the Entomologist could give only small attention to other crop pests. Notes on pests of tung oil, olives, coffee, *Sesbania*, *Indigofera* and *misuku* trees (*Uapaca kirkiana*) are contained in appendix A.

Crop Diseases.—The Plant Pathologist is stationed on the tea experimental station in Mlanje, and his work is therefore concerned with tea diseases in the first place. Mention has been made under the heading of *Tea* of certain lines of work to which may be added studies of tea branch canker, dieback of pruned branches, *Armillaria* root disease, tobacco leaf spot, coffee bark disease, citrus gummosis and citrus fruit blemish.

The cotton crop on the whole was remarkably free from disease and pests, only local manifestations of American boll-worm and stainers calling for mention, and, in the case of tobacco, a similar state of affairs existed with regard to leaf curl, rust and leaf spots.

Details of pest and disease work are given in appendices A and B.

Advisory Bodies and Policy.

The Board of Agriculture did not meet during 1935, there being no business, but an important step was taken in the formation of a Native Welfare Committee the function of which is to advise Government on co-ordination of the work and policies of those departments in whose hands lies the main responsibility for native development and general advancement and on matters bearing on native welfare in general. Administrative, medical, educational, forestry and agricultural interests are represented on the committee, and the aim of its work is native betterment through the attainment of increased material prosperity and comfort. The end in view is thus the recognition of native desire for improved living and social conditions and of the need for assisting native life to make progress towards that end along the lines of better food, better hygiene, better housing, better animal husbandry and better agricultural methods. The present efforts of the departments concerned in the movement will be supplemented within a few years, it is hoped, by the work of native community workers who will be trained with their wives at the Jeanes Training Centre in hygiene, sanitation, child welfare, care of cattle and use of their products, and in agricultural and forestry methods of proved value. Their small-holdings should be models of all they ought to be, and their houses, their children, their cattle and their gardens should be a demonstration of the possibility of putting their training to the benefit of themselves and of the community.

As far as the Department of Agriculture is concerned, the need to increase the production of native economic or cash crops is recognised, but this need is regarded as a means to the end of improved agricultural methods, improved food, housing, sanitation and better animal husbandry, and not as an end in itself. The interests of the native producer of cotton and tobacco are cared for inasmuch as the strains in cultivation are carefully selected, and, with the assistance of the Empire Cotton Growing Corporation on the one hand and of the Native Tobacco Board on the other, every effort is made to ensure a pure seed supply. Cultivation and grading of the products are taught by the field staffs of the department and the Native Tobacco Board, and their precepts are backed by demonstrations in the field, on experimental stations and in school gardens. Conditions of buying and selling of native cotton and tobacco are controlled by law, and care is taken to see these products are marketed not only in the best condition but also under conditions which are fair to the growers. In the matter of amount of production, the Native Tobacco Board considers it an essential part of its policy to endeavour from year to year to suit the production of dark tobacco on Crown land to market requirements or consumption in the United Kingdom in order to avoid over-production and a slump in prices. In the case of cotton, on the other hand, production may be increased. With regard to new crops, encouragement is being given to the growing of coffee and tung oil, the former on a restricted scale because of the uncertainty of the market and the latter on an expanding scale as seed becomes available. The department is prepared also to encourage the growing and export of oilseeds and cereals if and when market conditions warrant it.

In the encouragement of the above-named crops in native hands there is no clashing of interest between European and native except, perhaps, in the case of dark tobacco. It is said that the cheaper native dark tobacco has put the European direct producer (as opposed to the tenant producer) out of business, but, on the other hand, it can be said with truth that the native alone can produce dark tobacco as an economic proposition under prevailing market conditions.

The aim of the experimental and demonstrational work of the department is in general to provide results on which propaganda work can be based. The work concerns particularly problems of cultivation, intercropping and time of planting, soil conservation, soil treatment for maintenance of fertility with which is bound up the question of improved animal husbandry, seed selection, and the improvement and distribution of food and cash crop varieties. These lines of work are designed to lead towards a more permanent system of native agriculture and a better control and use of the land by placing in native hands tested methods and proved materials.

With regard to extension work, there is no agricultural teaching of the mass of the people as such. Reliance is placed instead on demonstrational work in native holdings, school gardens, special plots, and experimental stations. Such work is concerned with soil conservation, soil renovation, the better care of cattle and use of their products, and with methods of cultivation, and only methods which have been duly tried and tested are advocated. Courses of instruction are given to the native agricultural instructors of the department as opportunity offers in order to improve the value of their field work, and it is hoped that the work of the Department of Agriculture will be supplemented in a useful way by the community workers who are to be trained at the Jeanes Training Centre. On the other hand, the holdings of the community workers will be inspected by agricultural officers who will guide and advise the workers and use them as pioneers of improved methods, new crops and new varieties. The department is in favour of the training of natives for higher posts, but for the moment there is little or no prospect of such a development. When the time is ripe for it, there will be required a special training school which may or may not be run in conjunction with the Jeanes Training Centre. It will be essential to have it in close proximity to an experimental station.

The direction of the technical and experimental work (Zomba and Lilongwe stations) of the Native Tobacco Board is in the hands of the Director of Agriculture as chairman of the board so that continuity of aim and of policy is assured. Similarly, the officers of the Empire Cotton Growing Corporation whose work is primarily research on the cultivation and breeding of cotton varieties keep in close touch with the department, and the experimental stations of the department are used to duplicate experiments initiated at the Domira Bay station of the Corporation and to make trials of new varieties obtained in the course of selection and breeding. As the chief cotton authority in the country, the Cotton Specialist of the Corporation advises the Department of Agriculture regarding the multiplication and bulking of seed supplies for the cotton industry.

The relation between the work of the Department of Agriculture and a possible co-operative movement in Nyasaland may be mentioned. It is held that, transport problems being what they are in Nyasaland, the only prospect of the increase of production of certain native crops in certain areas, e.g., groundnuts in the northern districts and rice on the Lake shore, is to be found in co-operative collection and marketing (locally or abroad) of the crops. If and when a co-operative movement is begun, the department will be prepared to assist in every possible way the efforts of the various societies concerned with agricultural products.

The relations between European agriculturists and the department are primarily of an advisory nature. The department is consulted frequently on soil conservation and treament, pests and diseases, prospects and methods of development of new crops (e.g., citrus, tung oil, soya beans), problems of growth, manufacture (e.g., tea) and preparation (e.g., tobacco for a special market), and in giving advice its members draw upon their general experience in the field and laboratory and the results of the work of the experimental stations of the department. Of the experimental stations, only one, that in the Mlanje district, is devoted entirely to a European crop, viz., tea, and the officer in charge of it, who is also the Plant Pathologist, spends practically his whole time on the investigation of tea problems, particularly tea diseases. This arrangement is justified by the importance to the country of the tea industry and by the need for assisting that part of it which is still in the stage of development. The other laboratory and field officers of the department are also available to assist European agriculture, but in actual practice the larger part of their time is spent in the interests of native agriculture.

From the executive point of view, the department is brought into contact with European agriculturists in the administration of certain ordinances, e.g., those dealing with importation of plants and seeds, bush fires, locusts, and control of pests and diseases, and the general basis of departmental policy in such matters is that of consulting the interests of the country as a whole.

Part II. Work of the Department of Agriculture, the Empire Cotton Growing Corporation and the Native Tobacco Board.

Experimental Stations.

Port Herald.—At this station which is situated in the oldest and largest cotton-producing area, that of the Lower River, and works in collaboration with the officers of the Empire Cotton Growing Corporation, the cotton work consisted of a combined spacing and time-of-planting trial, the collection of data on stainer infestations and a repetition of a cotton strain trial at the *dimba* sub-station. With regard to time of planting, the results of the 1934-35 season showed that late December planting gave better results than mid February and early March. The results may be taken as in favour of early, that is, December planting, but in the meantime they are as good an argument for January sowing.

Experiments in the control of rosette disease from the point of view of planting dates and spacing are in progress while experimental work on time of planting of groundnuts showed that earlier plantings gave better results than later. In the case of sorghum, borer and fungus control trials with regard to planting dates and applications of compost gave greater yields from the later plantings but showed no result from smaller or larger amounts of compost. Good results, however, have been obtained from a two-course rotation in which a short-aged millet with cotton in one year and a short-aged millet followed by *Vigna* or *Dolichos* in the next year are used. This rotation is suitable for native use, and attention is now being given to the harvesting of the pulse crop as opposed to using it as a green manure. In mixed cropping cotton and gram are promising but cotton and groundnuts are not satisfactory.

The Port Herald station distributed North Nyasa varieties of rice and a large amount of seed of a short-aged bulrush millet originally got from the Transvaal. The latter is now well established in the Port Herald area.

Details of the above work will be found in appendix C.

Makwapala.—The Makwapala Experimental Station was taken over from the Empire Cotton Growing Corporation on January 1, 1935. Mr. Lawrence's report is as follows.

"Work on mixed cropping and native food crops was carried out during the year. A great deal of the work of harvesting and weighing had to be done in the writer's absence and for this reason no statistical work was attempted.

"Yields were poor on the whole and most of pulses and groundnuts gave very small returns. Maize and millet yields were fair. Cotton did badly and gave a yield per acre of just under 100 lb. of seed cotton. This was in part due to late planting and in part to its failure when mixed with other crops.

"Cotton mixed with maize did well when the cotton was planted a month earlier than the maize but failed when the planting times were reversed. The failure was not entirely due to the presence of the maize as cotton planted alone at the late date (mid January) also failed. It still cannot be said definitely that mixed cropping of maize and cotton is a good or bad practice. On the Lower River it is done without apparent damage to either crop and natives in the South Nyasa, Upper Shire, Mlanje and Blantyre districts follow the same practice. Next season a succession of plantings will be followed.

"Cotton with sorghum did no better at Makwapala than it did on the Lower River and the mixture is definitely one to be discouraged. Maize and sorghum, following the native practice in the surrounding district, do well together. Pigeon pea smothers cotton and almost any other crop unless the stand is thin or the interplanted crop can push up quickly above the shade; bulrush millet can do this and was the only crop amongst those tried that gave a yield.

"Native varieties of cassava and other food crops have been collected from various districts throughout the season and will be grown on the station next year."

North Nyasa.—Twenty acres, comprising four 5-acre fields, were cleared and stumped in 1934 and were planted in 1935. Two fields were used for cotton trials planned by the Cotton Specialist of the Empire Cotton Growing Corporation, one being a combined time-of-planting and distance and variety trial. Another field was laid down to a 3-course rotation of maize, cotton and beans while the fourth field was divided up into five plots which were occupied by maize interplanted with soya beans, sorghum varieties, finger millet selections, groundnuts of four varieties interplanted with cotton, and maize interplanted with cotton. Early growth was severely checked by locusts and drought, and replanting was done more than once. Groundnuts suffered from rosette disease, but the interplanted cotton did well. Finger millet selections appeared to show a marked superiority over local mixed seed and foxtail millet gave heavy yields.

These notes were provided by Mr. Charles who was in charge of the North Nyasa district and station. Unfortunately he had to be withdrawn from the district on account of ill-health before the results of his experimental work came to maturity, and it was not possible to replace him and carry on the experimental work.

Zomba.—The Zomba Experimental Station is financed by the Native Tobacco Board and is in charge of Mr. A. B. Cormack who is under the direction of the Assistant Director of Agriculture. The work of the station has been planned to show the best and most suitable methods of conserving soil, maintaining fertility and introducing rotations into agricultural practice with regard to both food and cash crops, and a reference to Capt. Hornby's report in appendix D will show that extension

work of practical value is carried on from the station. Special attention is given to the keeping of cattle and the making of compost, and the work on pasture grasses which is outlined in appendix D should give in time results of great interest and value. The station is at present in process of being re-planned, and in consequence appendix D does not contain the usual details of experimental results.

Lilongwe.—Like the Zomba station, the Lilongwe Experimental Station is financed by the Tobacco Board. During 1935 it was under the charge of Capt. R. M. Antill, Agricultural Superintendent of the Native Tobacco Board, and the experimental work was under the general direction of Capt. Hornby. Ridge terraces and other arrangements for minimising soil erosion have received due attention, and correct rotations and manuring are the subject of experiment. It is maintained that the continuance of the native dark tobacco industry of the Northern Province will depend in time on the development of a cattle industry and the intelligent use of manure in the rotation of tobacco and food crops, and attention has therefore been given to such matters as ploughs, pasturage, demonstration plots and wheeled transport. Reference is made later to the extension work done in the district served by the station. Details of the experimental work and of the station itself will be found in appendix E.

Mlanje.—The station is situated in the tea district. Its work is confined to tea problems and is in charge of the Plant Pathologist. Experimental work on the control of erosion, fertilizing, pruning methods and degrees of plucking was continued while results of investigation of tea seed storage, the causes of bent and twisted tap roots and the common method of planting out stumps were communicated to the industry and have subsequently been published in the form of a bulletin. Details of the work are contained in appendix F.

Domira Bay (Empire Cotton Growing Corporation).—The report of the officers of the Corporation is given in appendix G. It shows that progress in the production of acclimatised strains of U4 parentage has been made, but it also shows that the work of the corporation is based on a broad view of the needs of the cotton industry, including, as it does, accounts of pest studies, rotations and the search for a variety of cotton suited to the conditions of the Lilongwe plateau.

District Work.

The general aims of the district or extension work of the department and the Native Tobacco Board have been outlined under a previous heading.

In the matter of native agricultural practice, increased attention has been given to measures of soil conservation and maintenance of fertility in native gardens. In the Lower River the manufacture of rain-watered compost from farm waste is receiving attention, and Mr. Barker is arranging to carry out demonstrations at his Port Herald station and on small plots at suitable centres in the Chiromo and Chikwawa areas. He is also doing useful work in the distribution of selected seed of a short-aged bulrush millet, groundnuts and rice, and in popularising line planting and earlier sowing of cotton, while his talks to mission teachers at regular intervals are appreciated by the mission authorities.

In collaboration with the Assistant Chemist, Mr. Lawrence endeavoured to find at Makwapala a simpler form of the Indore method of making compost from waste. The product was not so good in appearance as that of the Indore method and it took longer to make. The new compost has yet to be tested in the field. In the Chiradzulu district a block of 170 acres was marked off for demonstrations of contour-ridging of gardens, and by the end of the year, 110 acres had been ridged. The natives appeared to be impressed with the work and 160 names of those who wished to ridge their gardens in the following dry season were given to Mr. Lawrence. Two other Native Authorities have asked for demonstration blocks in their sections and the same work has been extended to the Mlanje district. The terracing was done voluntarily, and the only cost to Government was the wages of three capitaos and their three mates trained in the use of road tracers. Mr. Lawrence is not unmindful of the usefulness of ground cover during the rains, and he is making trials of mixed crops for the purpose.

The extension work carried out from the Zomba Experimental Station by Capt. Hornby and Messrs. Cormack and Smithyman of the Native Tobacco Board is detailed in appendix D to which may be added the distribution of tung oil and coffee plants and of selected seeds to native growers.

In Mr. Kettlewell's district of Kota Kota (part), Dowa, Dedza and Ncheu (part) there is no experimental station as such. For instruction and demonstration gardens have been started at ten schools on the Lake shore. At present emphasis is being laid on the cultivation and selection of maize and the practices of proved value in cotton growing, and it is hoped to extend

the number and scope of the gardens year by year. Mr. Kettlewell established trial plots of cotton at seven villages in northern Kota Kota, but results were not encouraging. He also carried out a preliminary trial of six varieties of the castor oil plant with the help of Mr. Hoyle of the Empire Cotton Growing Corporation. The results were too uneven to be of value and the work will be repeated. An experiment in growing a small quantity of Spratt-Archer barley from Norfolk was conducted at Dedza. Germination was perfect, and, though the barley was a little weak in the straw, the ears filled out well and were harvested late in November. With a nitrogen content of 1.44 per cent., the sample proved to be good as a malting barley.

During 1935 some sixty well-sites were selected in Dedza and Ncheu by Mr. Kettlewell in conjunction with the administration. The wells in Ncheu will be completed in 1936. In selecting the sites choice was made of good soil which should carry good food crops and so restrict shifting cultivation and deforestation. Apart from making fuller use of a fertile area the wells should tend to draw natives from the hills and so ease the pressure on soil and timber where it is most keenly felt.

In the Lilongwe tobacco area, good progress has been made in the improvement of native holdings, in the use of cattle manure and in improvement of cattle management in co-operation with Mr. S. G. Wilson, Veterinary Officer.

Under the direction of Capt. Antill of the Native Tobacco Board, 2,500 acres of gardens have been protected against erosion. In this matter, the Crown-land native tobacco growers have set an example that might be followed with advantage by others. Bunding is done during the six or seven months of the year when the crops are off the fields, and during the other months the capitaos are employed on work of inspection and repair.

Demonstration plots to the number of 79 have been established in the areas under the charge of the Native Tobacco Board Supervisors, the aim being to show the merits of a 3-course rotation as opposed to a one-crop system. Drought was responsible for some poor yields, but little was to be expected from the first year's working. Propaganda in favour of the use of cattle manure has had good results. The work was taken up first by Messrs. Wilbraham and Jackson, and later by Mr. Scott, and a census made at the beginning of the 1935-36 season showed that 358 maize gardens and 5,138 tobacco gardens had been manured. The keenest interest was shown in plot demonstrations and manuring in the Lombadzi and Nsaru market areas and it is hoped that the enthusiasm will spread to other areas.

Good cattle management is absent in the tobacco districts of the Northern Province, and it seems that the most promising approach to better methods may be made by showing the native that his cattle have value beyond that of the customary bride-insurance. The Veterinary Officer, Lilongwe, Mr. S. G. Wilson, co-operated with Capt. Antill in selecting two progressive natives near Lilongwe and persuading them to roof their kraals and erect clean milking sheds, the incentive being the virtual monopoly of the milk supply to Lilongwe. The matter was taken up with zeal and the success of the scheme can be gauged from the fact that the demand in Lilongwe for the clean milk is greater than the supply. The other suppliers are already showing interest in the new example. It is realised, of course, that only a beginning has been made, but from the beginning it is hoped to work up a better appreciation of the value of stock, greater care in management, and the eventual making of compost.

Capt. Antill backed up his district propaganda by the monthly issue of seasonal notes in the vernacular called *Zokumbukira*. Duplicated copies to the number of 3,000 were issued to the Native Authorities of Lilongwe, Kasungu, Fort Manning and the highlands of Dowa and Kota Kota. No doubt the majority of the copies fall upon stoney ground, but there is evidence of interest in the notes on the part of many natives and intelligent reading of them. In this matter thanks are due to the District Commissioners for their help in distributing the notes and special thanks to Fathers Chateauvert and Lapointe of the Likuni White Fathers' Mission for translation work.

Capt. Antill also made efforts to arouse interest in dams as a means of conserving water for use in the dry season, and had one constructed across the Kakoma dambo, and he has done good work in seed distribution from the experimental station and in demonstrating the use of light ploughs and home-made carts.

This account of the extension work in progress may be concluded with an account of Mr. Charles' experimental work in the Mzimba district on the methods of cultivation of finger millet (*Eleusine coracana*). The purpose of the work was to find a method which could be

substituted for the destructive soil-burning method in vogue which has been the cause of degeneration of soil and vegetation in the district in which it is practised. Thanks are due to the District Commissioner and to Mr. Campbell of the Ekwendeni Mission of the Church of Scotland for their practical interest in the work. It is unfortunate that the work could not be continued. Mr. Charles' report is as follows.

"The *lipoko* (*Eleusine coracana* or finger millet) plots at Mzimba and Ekwendeni under the supervision of the District Commissiner and Mr. Campbell respectively gave interesting results.

"At Ekwendeni between the *vizozo* (heavy burning) transplanted plot and the *magadi* (light burning) transplanted plot there was little difference. The *vizozo* and *magadi* broadcast plots were similar but gave just over half the yield of the corresponding plots. The unburnt transplanted plot was identical with the burnt broadcast plot, but the unburnt broadcast plot was poor. The most striking result was from the manured transplanted plot which gave nearly four times the yield of the manured broadcast plot (which was very choked with weeds) and nearly twice the yield of the next highest plot, the *vizozo* transplanted. The manured maize plot gave nearly ten times the yield of the unmanured maize plot, and provided a very striking demonstration.

"It must be pointed out that these plots were not replicated and that yield figures must be treated with suspicion. The fact that heavy burning appears to give no increase over light burning is probably due to uncontrolled factors and may not be true in fact.

"Results at Mzimba, though not so striking, were generally similar to those at Ekwendeni though the best plots did not yield so highly as the best plot at Ekwendeni. Transplanting gave a definite increase, but, as at Ekwendeni, heavy burning appeared to yield no higher than light burning. Lipoko transplanted after sunnhemp dug in in the previous year yielded well when compared with the untreated plot.

"Though manuring over no manuring and transplanting over broadcasting gave decisive results, the extra labour involved hardly compensated for the increase in yield, with the possible exception of the maize plots. In the case of the manured plots weed control was difficult. This is an argument in favour of the Indore compost process, but the successful manufacture of this product would be beyond the comprehension at present of the somewhat conservative natives of the district. It was found at both sets of plots that the labour involved in the transplanting of *lipoko* was immense and that, unless the garden was planted out at the exact moment when climatic conditions were favourable, the effort was wasted and almost complete replanting was necessary.

"A number of natives visited the plots and, though duly impressed by the beneficial effects of transplanting and manuring, said that the labour of carrying manure from the cattle-sheds to the *lipoko* gardens, always some miles distant on a hilltop, and the extra hand-weeding involved, were too great. Their point against transplanting was that the owner of a garden would be unable to plant out his *lipoko* sufficiently quickly during the short time when conditions were ideal; he was unable to emulate the European who could command a large labour force for a short time."

Chemistry and Soils.

Dr. Armstrong Black, Assistant Chemist, was on leave during the year and Capt. Hornby was employed as usual on administrative work rather than in the laboratory. He found time, however, for a certain amount of work on a problem of tea fermentation which has arisen, and his report follows in his own words.

"During the past two years I have endeavoured to solve the problem of the poor fermentation of certain leaf grown on soils in the high-rainfall belt of Mlanje, and encouraging results have lately been obtained by the application of salts containing certain minor elements.

"It is necessary to point out that the leaf in question on reaching the fermenting floor remains grass-green for several hours longer than the normal time taken for leaf from red soils in the lower-rainfall belt to take on a medal bronze coloration by the action of oxidising enzymes on the tannin and other compounds. It is only possible to manufacture a passable tea from the leaf in question by mixing a proportion in the withering lofts with leaf from the red soils.

"I have to acknowledge great help from the Plant Pathologist who applied many of the salts to tea bushes individually and to the soil in various plots. The problem is unconnected with that of tea yellows and it occurs on soils where potassium, phosphates and nitrogen are not deficient.

"Experiments with compounds of calcium, magnesia, and sulphur had early on shown (1934) that the problem could not be solved by applications of any of these elements. The well-known influence of manganese compounds on the oxidising power of plant tissues led one to suspect that this element in the soil was unavailable. Some of the early tests on individual bushes towards the end of the season were encouraging, response to various applications to the soil and cut branches being obtained in ten days. The leaf was tested by withering separately for the normal period and then macerating in a pestle and mortar, the mass being then exposed in a damp state and the time taken for the bronze coloration to appear being observed.

"Another test applied was the coloration produced in a 2 per cent. solution of catechol in six hours by measured amounts of leaf tissue crushed in a mortar.

"I also carried out, in conjunction with the field experiments, estimations of manganese in samples of tea and soil and found very little difference in the contents of these collected from various areas.

"Furthermore, Messrs. Imperial Chemical Industries Limited when I described our problem to them kindly offered to examine spectrographically samples of tea and soils from Cholo and Mlanje. These were examined at their Agricultural Research Station, Jealotts Hill, Berks., and thanks are due to Dr. H. J. Page and the staff of this station for their help in this matter.

"The figures for manganese for soil and tea were of the same order of magnitude as my own and indicated little difference in the content in various teas and soils.

"Unfortunately, as will be seen later, no figures could be given for copper as the carbon electrodes used contained some copper. Zinc also was not detected. Boron was present not greater than 0.0005 per cent. in the soils and varied from .001 to .002 in the tea samples, no connection between the amounts present and good quality due to fermentative power being observed.

"Messrs. Imperial Chemical Industries have kindly consented to help further in the problem.

"Unfortunately the response to applications of manganese salts in our field experiments soon wore off, especially as the cold and dry season advanced, and during the period of pruning operations few experiments could be made.

"With the approach of the main rains and the hot season further experiments were laid down with other minor elements including copper, zinc, boron and aluminium salts alone and in conjunction with manganese salts.

"A good response to copper compounds applied in suspension or in solution as a spray was obtained after a reasonable time. Leaf from bushes to which Bordeaux mixture, copper sulphate and copper acetate had been applied in this manner fermented well in comparison with leaf from bushes untreated and sprayed with zinc sulphate, ammonium alum, and zinc acetate. Conflicting results were obtained where the salts were applied to the soil round the bushes and in certain cases no response was obtained with copper salts applied in this manner. Also when such salts in solution were applied to cut branches the results were inconsistent.

"There is still a large amount of work to be done in the final solution of this problem in such aspects as the concentration of the solutions to be applied, the method of application and the possible combination of various minor elements in solution or as side applications to bushes on the various soils. The results during 1935 however encourage us to believe that we are on the right track.

"Thanks are due to the manager of Lujeri Estates, Commander E. G. B. de Moubray, for his continued interest and great help in the problem."

Dr. Armstrong Black's report is as follows.

"During the year comparative little has been done in the further investigation of Nyasaland soils. Prior to my departure for leave some preliminary work on the isolation of clay fractions was carried out and the necessary procedure and apparatus standardised.

"While on leave I spent a month at Harpenden and during that time I studied the recent methods which were being used at Rothamsted. As it happened, the work in progress there was on lines similar to the work which I hope to carry out with Nyasaland soils. In particular, they were employing new methods of clay analysis and a modified method of dry combustion, all of which, I think, will be particularly well suited to the work here. I also learned something of the technique of the mineral analysis of sands.

"Since my return from leave, I have carried out a series of experiments on the decomposition of chromic acid in sulphuric acid. This work was necessitated by an attempt to standardise the chromic acid determination of soil carbon at present used in this laboratory and by a recently proposed modification. This work has yielded unexpectedly regular and interesting results and I hope to apply the new information to various methods of chromic acid carbon determinations.

"A series of monthly analyses of milk from North Naiwale estate was carried out, Captain Hornby doing this work while I was on leave. The work extended over the whole year, and, while it would be premature to draw any conclusions from one season, there appears to be a relation between the rainfall and the composition of the milk. Thus high rainfall is associated with a high content of solid matter but a fall in the ratio of solids not fat to fat. This indicates that the gain in total solids is produced chiefly by an increase in the fat. In view of the experience gained during 1935, I think that future work should be done on weekly composite samples from the whole herd.

"The remainder of my work has been the usual varied routine which includes preparation of decinormal iodine and the analysis of stomach contents, in cases of suspected arsenical poisoning, for the Veterinary Department, reporting on soil samples submitted by planters, analysis of grain, and a certain amount of work on tea from various sources".

Entomology and Plant Pathology.

Details of plant pest and disease work are given in appendices A and B.

Botanic Gardens, Zomba.

The gardens are now being used as a plant introduction station. Introduced varieties of sugar cane, sweet potato, pyrethrum and vines form medium-scale plantings. Trees of *Bassia longifolia*, *Caesalpinia spinosa*, *Ceratonia siliqua* and *Anacardium occidentale* have also been planted for observation and seed production. Soil renovation by means of pigeon pea and soya beans between ridge terraces has been continued, and all rubbish and trash was collected and converted into compost.

Plant Introductions.

Plant introductions of 1935 were fewer in number than those of recent years. The following notes on species recently introduced may be of interest.

Artemisia brevifolia var. *maritima* is a source of santonin and has been successfully raised from imported seed several times. Seed collected in Zomba, however, is not viable, but healthy plants can be propagated by cuttings and divisions.

Citrus trees imported from Southern Rhodesia and South Africa have been planted on the lateritic red loams of Zomba. Growth has been very poor on these soils and the plants have now been removed to an area of deep alluvial soil where they can be irrigated. Bergamot orange trees suffered from a gummosis which was cured by cutting away infected parts and spraying with one per cent. copper sulphate on the cut portions.

Chicory thrives in Zomba. The leaves may be used as a spinach and the roots dried out in the ordinary way.

Cactus of six spineless varieties has been tried but they are attacked eventually by a slimy rot and show little promise in these wet regions.

Cow pea, a Poona variety imported from Southern Rhodesia, is an attractive erect-growing plant and grows much better than other varieties on Zomba soils.

Grasses. The following kinds have been introduced and planted in plots:

Hunyani grass
Kafue grass
Pampas grass
Paspalum urvillei
Paspalum dilatatum
Paspalum spp; two from Zomba and Mlanje
Purple top buffel grass
Reed timothy
Rhodes grass
Swamp couch
Woolly finger grass; two varieties

Most of these were brought from Southern Rhodesia and observations will be made on the yield of hay, habit of growth and the effect of the long dry season.

Pennisetum spp. from the Royal Botanic Gardens, Kew, grew fairly well in 1935. The Plant Pathologist has identified as *Cerebella* sp. a smut-like fungus on the inflorescences which caused some loss during the wet season. *Pennisetum typhoideum* was particularly infected.

Other species tried out were:

P. gambiense (both long-headed and early-maturing)
P. pycnostachyum
P. gambiense × *pycnostachyum*
P. leonis
P. spp. from Nigeria, known as *napelga*, *nasabliga*, and *tamale*.

Sunn hemp. A Somerset variety from Southern Rhodesia gives a very heavy crop of seed.

Sweet potatoes. Two excellent varieties from Southern Rhodesia are *Linslade* and *Early Butter*.

Tephrosia radicans is of considerable promise as a low-growing ground cover in tea and coffee. In the early stage it is rather slow growing but once established forms a dense mat. Trials are continuing.

Publications.

No bulletins were issued during 1935. The Native Tobacco Board published a booklet in the vernacular entitled *Plants and Gardens* and written by Capt. Antill.

Staff.

The Entomologist, the Assistant Chemist and Mr. B. C. G. Charles, Agricultural Officer, were on leave from the Department of Agriculture during the year under review. Of the Native Tobacco Board staff, Mr. F. I. Scott and Mr. G. D. N. Bartlett were on leave.

Statistics.

Statistics relating to European and native agriculture and livestock are given in appendix H.

Native Tobacco Board.

The members of the board were the Honourable the Treasurer, the Assistant Director of Agriculture, the Provincial Commissioner, Northern Province, the Honourable W. Tait-Bowie, O.B.E., Mr. A. F. Barron, O.B.E., and the Director of Agriculture (chairman). The principal matters before the board were the closing of the Kasiya and Tiwi buying stations and the establishment of a new station at Nsaru, a step which was in accordance with the policy of concentrating on the best tobacco areas and establishing permanent markets in them, sale of seed in the Northern Province, water supply and sanitation of the northern buying stations, reduction of the buying tax, salaries of supervisors, publication of prices paid to growers, the encouragement of the growing of special leaf for the West African market and the consequent establishment of a buying station at Zomba, the first in the Southern Province.

Acknowledgments.

The work of the Department of Agriculture and the Native Tobacco Board has been assisted in generous manner by the British Cotton Growing Association, the Empire Cotton Growing Corporation, the Nyasaland Tobacco Association, the Nyasaland Native Tobacco Exporters' Association, the Nyasaland Tea Association, the officers of the administration and by numerous individual agriculturists and commercial authorities, and thanks are extended to all concerned.

PART III.—Financial Statements.

The following statement shows the 1935 expenditure and receipts of the Department of Agriculture. The Native Tobacco Board statement is in appendix I.

Expenditure.

Personal Emoluments	Approved estimate	Amount spent
	£	£ s. d.
European staff	7,631	... 7,542 3 1
Native staff	604	... 600 7 3
	8,235	8,142 10 4

THER CHARGES.

	Approved estimate £	Amount spent £ s. d.
Transport	627	794 2 0
Travelling	13	8 8 0
Passages	497	633 14 8
Experimental Work	965	936 13 6
Distribution of Cotton Seed	400	1,930 16 10
Botanic Gardens	45	43 14 6
Contribution to Agricultural Show	120	120 0 0
Treatment of Plant Diseases, Tobacco Pests, etc.	150	69 7 4
Library	40	36 12 9
Tools and Equipment	200	169 18 1
Seeds and Plants	50	36 4 9
Incidentals	20	9 8 7
Uniforms	18	14 18 5
Native Cotton Industry	100	29 18 6
Contribution towards Upkeep of Experimenta Stations, (E.C.G.C.)	300	300 0 0
Transport (E.C.G.C.)	300	235 1 7
Contribution to Native Agricultural Board ...	1,800	—
	5,645	5,368 19 6
SPECIAL EXPENDITURE.		
Anti-Locust Campaign	750	832 8 9
Bush Cars	—	38 10 8
Agricultural Officer's visit to Mazoe ...	—	25 7 6
Agricultural Supervisors	—	1,668 19 10
Purchase of Boat	—	65 3 2
	750	2,630 9 11
	14,630	16,141 19 9

	Approved estimate	Amount received £ s. d.
Revenue.		
Sales of Agricultural Produce	80	101 18 4

PART IV. SUMMARY OF LEGISLATIVE CHANGES AFFECTING AGRICULTURAL INDUSTRIES DURING 1935.

With regard to native tobacco, an amending ordinance was passed to allow an earlier registration (May 1) of Crown-land growers and ensure an earlier termination of registration certificates.

Ordinance No. 1 of 1935 established a tax on Crown-land cotton, the proceeds of which must be spent on the industry. At present the tax is 2d. per 100 lb. of raw cotton. Two amending ordinances came into force. The first requires the approval of the Governor for any inducement other than the fair purchase price to enter into a contract to sell cotton, and the second enables temporary licences to gin Crown-land cotton to be issued for experimental purposes. In the particular case which the ordinance was designed to meet, it was desired to gin a sample of cotton with roller gins at a ginnery which, unlicensed at the time, was the only ginnery equipped with roller gins instead of the saw gins in common use in Nyasaland.

The Tea Cess Ordinance provided for the collection of a cess on exported tea. The funds derived from the cess must be used for the benefit of the tea industry in such manner as the Nyasaland Tea Association with the approval of the Governor may determine. The present cess is 2d. per 100 lb. The Tea Ordinance 1934 was amended in three particulars. The first was the subsitution of 17,700 acres for 17,000 acres as the total tea acreage of the country at the end of the present period of restriction in March 1938. The second was the prohibition of the export of tea seed, and the third was the institution of a permit for the importation of tea seed or tea plants.

W. SMALL,
Director of Agriculture.

Report of the Entomologist.

I was absent from the Protectorate on home leave from March 24th to November 1st. While in England I attended the Fourth Imperial Entomological Conference from 19th to 27th September. Seventy-four maps, showing the monthly movements of locusts, egg-laying and hopper development since the initial invasion of the Protectorate were drawn and sent to the Imperial Institute of Entomology. Notes collected over a period of two years on the habits of *Nomadacris septemfasciata*, Serv., together with meteorological data affecting their seasonal movements, were written up and left in charge of Dr. B. P. Uvarov. At Port Elizabeth on my return I took the opportunity of visiting the Addo and Amanzi estates in the Sundays River citrus area.

Locusts.

During my absence Mr. G. D. Hayes was temporarily employed in keeping records of swarm movements, breeding, meteorological data and all information concerning the locust situation in general. The diligent work of Mr. Hayes has prevented the serious break in the connected records that would otherwise have occurred. It has not yet been possible to work through in detail all the information collected during the year and only a general summary of the main occurrences can be included in this report.

Hoppers.—On the whole the climatic conditions of the 1934-35 breeding season appeared to be highly detrimental to hopper development. The worst affected area was to the south of Port Herald in the Lower Shire district where hopper bands of considerable size moved from bush country into the cultivated lands during February and did considerable damage to both cotton and food crops. On the other hand, the remainder of the Lower Shire and the Chikwawa districts together with most other districts reported the hopper situation, at the same period, to be considerably easier than in previous years. In some cases, areas in which eggs were laid produced no hopper bands at all, and in other places, for example the Nkwale area of Dowa district, no flying swarms developed from the hoppers that were present. The destruction due to the fungus disease *Empusa grylli* was very considerably greater than had been previously experienced; it commenced in January, some six weeks earlier than in the 1933-34 season, and heavy mortality was recorded among even first instar hoppers.

Late oviposition again occurred in two confirmed situations, during February, in the Fort Manning and Zomba districts with the result that for a short period in that month there were present in the Protectorate at one and the same time, egg-laying swarms of the 8th generation, eggs, hoppers in all stages and some newly-developed adults of the 9th generation.

Flying Swarms.—The first adult swarms of the 9th generation were reported from Chiromo in the Lower Shire district on February 11th and from Lake Shilwa about 20th February. The comparatively small number of swarms that developed and the variable weather conditions rendered the initial movements of the flying swarms more indefinite than usual, but by the month of May the tendency to vacate the lower levels and enter the hilly country was noticeable. In July swarms were reported from the higher altitudes only. The exceptionally cold weather experienced in the middle of the year doubtless had the effect of keeping the swarms very quiescent, but it also appears to have checked the fungus disease as all swarms observed were reported free from *Empusa*. During these months 'semi-solitary' locusts (? phase *dissocians*) were to be found in all large, tree-less dambos and on Zomba and Mlanje plateaux, and it would seem that dispersal of the swarm individuals was taking place on a greater scale than in previous years. In August the south to north movement began in most districts, giving way to indefinite flight in September but reviving again in October in the Lower Shire and Chikwawa districts. Thus the northerly movement from the Zambezi valley has been repeated each year. On August 19 a swarm of *Locusta migratorioides*, R & F., was reported in Kawinga's section of the Upper Shire district. Although not apparently seen by any European and its further movement being totally lost, reliable native information asserts that this was a *Locusta* swarm. It is the only record during the year of this species of locust.

Egg-laying, 10th Generation.—The first oviposition was reported from the Chikwawa district on November 17, coinciding with a 2 inch rainfall. During the first week in December egg-laying took place on two lines running from south to north from Mlanje district across the Tuchila river into Chiradzulu and Zomba districts. Inspection of part of this area showed the laying to be, in the main, very thin and scattered and in some places being heavily attacked by *Mylabris* grubs. Further scattered laying took place in December along the Shire river valley in the central section of the Blantyre district and in the Upper Shire district.

The break of the rains in the Southern Province was very variable. In September and October no rain fell in the Mlanje district and in November and December, while heavy precipitations occurred over most of the province, the northern part remained dry.

Damage.—As stated in the annual report for 1934 considerable damage was done in certain areas to early plantings by flying swarms of the 8th generation. In some cases this led to an acute shortage of seed stocks owing to repeated attacks by egg-laying swarms in the same places. Although quantities of sweet potato vines were distributed in the distressed areas, bad weather conditions followed and many crops not damaged by locusts failed to give any yield. The areas that suffered most severely were the north-west portion of the Lilongwe district, part of Ncheu and the eastern half of the Upper Shire and South Nyasa districts. In the Upper Shire district it was noticeable that damage was greatest in the gardens of the Yao tribes and much less among the Anguru. Damage by hoppers south of Port Herald has already been mentioned.

The acute shortage of food felt in some districts towards the end of the year, however, was due more either to drought or excessive rain than to locust damage.

Crop Pests.

Little work on other pests was, of course, possible during the few months of the year I was in the Protectorate.

Tung Nut.—It would appear that a Bostrychid, probably *Apate indistincta*, Murray, occasionally bores in the trunks and branches in the same way as this beetle attacks coffee. Originally the tunnels were found completely blocked with an exudation of gum, but the Plant Pathologist found at Mlanje tunnels containing two desiccated beetles as well as the gum. A similar gumming effect has been observed on the fruits, where newly hatched lepidopterous larvae have attempted to burrow in, but in no case has complete penetration been found. This insect is thought to be *Chloridea obsoleta.* R., the American bollworm, but only minute shrivelled caterpillars have been found and all eggs kept in captivity have been parasitized by a Chalcid up to date. A mild attack on the foliage by the Galerucid beetle *Exora apicipenne*, Jac., was observed in November, when the usual early brood of this beetle hatched out. The beetle is usually associated with sunn hemp, which had been grown among the tung nut trees, but by the end of December very few beetles were to be found. The scale insect *Aspidiotus lataniae*, Sign., has been recorded from the tung nut trees at the Zomba Experimental Station but does not show any signs of increasing.

Olives.—Considerable damage to the foliage of trees in the Cholo district has been done by the Tingid, *Teleonema australis*, Dist. This is a small flat, sucking insect, allied to the larger sucking plant-bugs, and capable of fairly rapid development so that enormous numbers are produced early in the season. The insect has so far been reported as indigenous to South Africa, but it would seem that its range extends considerably farther north. The effect on the trees may lead to complete defoliation and the heaviest infestation has so far been observed from March onwards, only a few adults being found in December 1935 though the effect of the attack was still noticeable then. It should be possible to control the insect without much difficulty by soap solution, nicotine spray or Katakilla, if used at the end of the rains. Further observation, however, may show a connection between intensity of attack and soil conditions.

A light infection of olive trees by *Aspidiotus lataniae*, Sign., has also been noticed.

Coffee.—The indigenous shrub referred to in the annual report for 1933 as being a host plant of the white stemborer (*Anthores leuconotus*, Pasc.), has been identified at Kew as *Erythroxylon emarginatum*, Sch. and Thom. The only vernacular name so far heard is *botwa* and it is said that it is used for making arrows, but this name does not seem to be well-known.

Sesbania.—Defoliation of this shade crop is sometimes caused by a Chrysomelid beetle with yellow-brown wing cases and a blue-black pronotum, *Mesoplatys ochroptera*, Stol.

Indigofera.—The Chrysomelid beetle, recorded and described in the annual report for 1932, as doing considerable damage to this cover crop, has been identified as *Phaedonia areata*, F., and the Carabid beetle of which the larva is predaceous on the larva of this pest as *Chlaenius* sp.

Misuku (*Uapaca kirkiana*).—Further evidence of sucking insects producing fungoid-like markings on plant leaves has been obtained by the Plant Pathologist by tracing the large brown spots on *misuku* leaves to be due solely to the feeding of a small Pentatomid or shield-bug, *Bryocoropsis* sp. nov.

ACKNOWLEDGMENTS.

Thanks are due to the Imperial Institute of Entomology for the above identifications and also for the identification of thirty-two species of *Acridiidae* and two species of *Thripidae*.

COLIN SMEE,
Entomologist.

Report of the Plant Pathologist.

Tea Diseases.

Branch Canker.—This disease was reported from a garden of Indian-jat tea, which was recovering from medium-heavy pruning after a two-year plucking cycle. The tea was very healthy prior to pruning. The symptoms of the disease appear to be exactly similar to those described by Petch in *Diseases of the Tea Bush* (p. 99) under "the typical Ceylon branch canker of horizontal branches" caused by *Macrophoma theicola*. His description is given here, as it cannot be improved for that of the disease in Nyasaland.

> "It attacks the upper surface of the branch, and progresses chiefly lengthwise, killing the bark and blackening it internally, and discolouring the wood to a variable depth. Sometimes the diseased area appears blackish externally, but this is usually masked by the covering of lichens, etc., on the branch. The earliest visible indication of the disease is generally the appearance of a slightly raised line on each side of the branch. This line marks the limit of the affected region, and is the beginning of the formation of a callus. Subsequently, the dead bark separates from the wood and falls off, or is withered away, and the exposed wood rots. As this takes place in the interior of the bush the early stages are seldom noticed, and by the time the bush is pruned the canker may be in an advanced condition."

In Nyasaland three different fungi were isolated from the cankers when the latter became conspicuous in July, after being pruned in May. An inoculation experiment was carried out in September on Indian-jat bushes which had run for two years unpruned. Each of the fungi was inoculated into the larger branches after the bushes had been treated as follows:—(1) heavily clean (or stick) pruned, (2) same as (1) but leaving three rim lungs, (3) lightly clean pruned, and (4) unpruned.

In December it was evident that (1) many more branches were cankered than had been inoculated, so that the inoculations proved nothing; (2) all the heavily pruned bushes were badly cankered, the rim-lung bushes were affected only on a few pruned branches, the light pruned bushes were also slightly affected, while the unpruned bushes remained healthy; (3) the cankers were situated in every case only on the upper surface of the branches, and were most pronounced on those which were most horizontally inclined; (4) the V-cut fungus inoculations were covered with cotton wool and brown paper and less cankering tended to occur under the area covered by the wrapping than beyond the wrapping; (5) the roots of all bushes were amply supplied with starch; (6) healthy shoots arose from the collar of the bush; (7) the amount of cankering was considerably greater in the bushes experimented on in September (hot, dry season) than in the bushes found affected after pruning in the cold season; (8) the growth of the bushes before pruning was such that the foliage of the bushes touched on all sides, forming a dense sheet of tea; (9) the disease is not common throughout other estates in Nyasaland where the almost universal method of pruning is annual; (10) scraping the bark of lightly affected branch lesions showed that the outer bark was still green, while only the inner bark, pericycle, phloem, and cambium was discoloured, the wood being normal in colour; sections of the discoloured portion of such lesions yielded no organisms in culture.

The deduction reached from the above notes is that this canker is due to sun-scorch of the branches which have been growing under heavy shade with minimum ventilation, thus developing comparatively delicate bark.

The various fungi enter as secondary organisms and only travel extensively in the wood of the branches until the new shoots grow. In most cases the branches are not killed, and they are able to put out vigorous terminal shoots, although the flow of sap must be considerably impeded in the most heavily cankered branches.

The control measures against this disease must simply aim at preventing the sun getting free access to the branches of bushes which are pruned biennially. It is suggested that the prunings are left on top of the bushes until the new shoots have grown sufficiently to provide the necessary

shade for the branches. A solid mass of shade is not required, all that is wanted being sufficient material to cause flecks of shade to fall on the branches throughout the day. Any leaves that may be growing on the branches after pruning should be left; they are, however, comparatively scarce on biennially pruned bushes. Shade thrown by rim-lung branches would undoubtedly be helpful when pruning is carried out in the cold season and the sun is relatively low in the sky all day.

That the sun can be hot enough to cause scorching at the start of the cold season has been shown by the occurrence of collar scorch in one-year-old nurseries, as reported in the annual report of the Department of Agriculture for 1934.

Dieback of Pruned Branches.—Another manifestation of scorching has been found in biennially pruned bushes. Here again the effect has been more marked in gardens pruned in hot weather than in those pruned in the cold season.

In this case, the characteristic symptom is a large proportion of the centre branches dying back in bushes which have become silted up by soil, especially next to contour bunds. Examination of these bushes showed that the affected branches were ringed by scorching at the ground level. The ringing is clearly defined. The branches in the centre of the bush are numerous in silted-up bushes and tend to grow vertically. Although a light type of pruning was employed in order to leave a certain number of leaves on the bushes, it was found that the centre branches bore no leaves, so that they did not shade the soil. This disease occurred in a local-jat garden with the bushes somewhat widely spaced, so that the foliage allowed more ventilation than in the Indian-jat tea affected with branch canker. As long as they were not silted up, they received sufficient ventilation to ensure a certain degree of hardening of the bark of the centre branches. In the silted-up plants, however, the leaves of the outer branches were in contact with the soil, thus preventing adequate ventilation for the centre branches which developed tender bark and so proved susceptible to scorching at the soil level.

Here again control measures should be based on the prevention of the sun heating the surface soil in contact with these delicate-barked centre branches.

Armillaria Root Disease.—*Glyricidia maculata* has been established in some old tea gardens for the purpose of obtaining loppings as a source of green manure. This plant may prove to be an agent which will accelerate the spread of *Armillaria* root disease in old gardens where the disease is initiated sporadically and where the subsequent method of infection is normally by contact between the roots of healthy and diseased tea bushes. The rate of spread is comparatively slow when *Glyricidia* is absent. Observations indicate that, when the *Glyricidia* trees become infected, the fungus travels freely along their lateral roots, which may be distributed throughout an area containing fifty tea bushes. It is evident, therefore, that the disease *may* be spread comparatively quickly to a large number of tea bushes round an affected *Glyricidia* tree.

Apart from the fact that *Glyricidia* is somewhat difficult and tiresome to establish in old tea gardens and that the yield of loppings is disappointingly low in Nyasaland, it is undoubtedly a source of danger to the tea as a potential spreader of *Armillaria* root disease. For these reasons it is not a highly desirable source of green manure in Nyasaland tea gardens.

Other Diseases.

Tobacco Leaf Spot.—A leaf spot disease of tobacco was submitted for examination by Dr. C. W. Arnold of the Imperial Tobacco Co. At his request single spore cultures were obtained from the fructifications in which he was interested. These cultures were sent to the Imperial Mycological Institute where they were identified as a species of *Pleosphaerulina* (possibly *P. argentinensis* Speg.).

Coffee Bark Disease.—This disease was described in the annual report for 1934 and it was stated that "the disease is apparently caused by a species of *Fusarium* similar to, if not identical with, *F. lateritium* which was shown by Storey to be the cause of the East African disease." This has since been verified by the Imperial Mycological Institute from a culture submitted to them isolated from the Nyasaland coffee bark disease.

Citrus Twig Gummosis.—A dieback of Bergamot orange twigs, accompanied by gummosis, has occurred during the year. The bark of the affected areas was slightly raised and yellowish brown in colour with a clearly defined margin. Gum exudations took the form of a thin surface layer over the affected bark and also of gum masses at the base of the affected areas. Considerable difficulty was encountered in isolating one fungus consistently from the junction of the healthy

and diseased tissue. No opportunity arose to carry out inoculation experiments. Control measures, however, should consist in painting the cut ends of pruned branches or twigs with some fungicidal paste such as is used on the cut surface of rootstocks after budding.

Citrus Fruit Blemish.—Citrus fruits have been found badly blemished for marketable purposes by their skin being dotted with slightly sunken spots, 4 to 9 mm. in diameter. The surface of the spot is heavily russetted in the immature fruit, but in the mature fruit the russetting is very thin and irregular over the spot. The spots are irregular in outline with a diffuse margin. Oil glands tend to be raised above the surface of the rind in and especially round the margin of the spots. Transverse cuts through the skin show that the spot is sunken; the rind is not discoloured except that it has a slightly oilier appearance than normal. The disease does not appear to affect the taste of the fruit. The cause of the disease is not known.

Cotton Staining.—A visit was made to the Cotton Experimental Station at Domira Bay at the request of Mr. Hoyle of the Empire Cotton Growing Corporation in order to discuss the problem of staining.

The visit was valuable in demonstrating how meagre is the knowledge of the life-cycle of the cotton staining fungi, of which *Nematospora gossypii* is by far the commonest at Domira Bay. Until more data are obtained on that subject any attempt to formulate control measures from the mycological view point must be based largely on theory.

R. LEACH,
Plant Pathologist.

Port Herald Experimental Station.

The comprehensive range of field experiments included in the programme of work of the main *mphala* experimental station was widened to include (*a*) a time-of-planting trial with groundnuts, (*b*) a combined spacing and time-of-planting trial with cotton, (*c*) the collection of data on cotton stainer infestations and (*d*) a repetition of the cotton strain trial at the *dimba* sub-station.

In all cotton work the closest collaboration with the Cotton Specialists of the Empire Cotton Growing Corporation in maintained and the joint investigation of the various problems associated with the cultivation of this crop proceeds in a satisfactory manner.

An unfortunate feature of the past season was the severe floods of long duration associated with many *dimba* areas. These inundations rendered abortive all main work on the *dimba* sub-station which was the more regrettable since in the early growing part of the season all crops represented in the various trials showed promise of giving particularly good results.

Groundnuts.

The results of a time-of-planting trial with Spanish Bunch groundnuts were arrived at by the use of Engledow's chessboard method.

The trial included five treatments as given below. Thees were replicated five times in plots each of 1/11th acre approx. The spacing employed was 2 feet by 1 foot.

	Treatments	Treatment totals
A.	19 November ...	596
B.	4 December ...	462
C.	27 December	231
D.	15 January	422
E.	31 January	233

It was found that the first planting (A) was barely better than the second (B) though significantly better than the last three of the planting dates (C, D and E).

For the coming season this trial has been elaborated and a new lay-out designed. The latter will provide for a similar range of planting dates as well as two different spacings. Work on this trial is now being conducted in collaboration with the Plant Pathologist and its further object is to ascertain whether any degree of control in respect of rosette disease can be obtained. From the rosette control viewpoint close planting gives humid conditions amongst the plants which are thought to encourage death of the aphids from fungus disease.

Sorghum.

The borer and fungus control trial was again attempted and it was unfortunate that in March locusts visited the field in which the trial was accommodated. However, as only a small amount of damage was done and as this appeared to be evenly distributed, it was felt that some value might still attach to the results obtained. These are quoted below but in the circumstances should be treated with due caution.

Plots approx. 1/20th acre; planted 3 feet by 9 inches; 1 plant per hole.

	No compost	5 tons per acre	10 tons per acre	Total
Planted 27/11/34	126(A) ...	127(B) ...	99(C) ...	332
Planted 22/12/34	145(D) ...	198(E) ...	216(F) ...	559
Total	271 ...	325 ...	315 ...	911

	Degs. of freedom	Sum of squares	Variance
Blocks ...	5 ...	1312	
Treatments ...	5 ...	1729 ...	345.8
Error ...	25 ...	1681 ..	67.2
Total ...	35 ...	4722	

$z = 0.8187$: 1% value of $z = 0.6747$

Therefore the experiment is significant.

Standard error of one plot = 8.2 = 32.4% of the mean.

Significant difference between totals of 6 plots = 59 ... ... (1)
" " " " " 12 " = 83 ... ... (2)
" " " " " 18 " = 101 ... ... (3)

From (1) it is apparent that F is better than A, B, C, and D and that E is better than A, B and C. But 559 is better than 352 (3) while there is no difference between 271, 325 and 315 (2). From this we conclude that the main influence is a greater yield from later planting and that the application of compost has little or any influence on the yield, i.e., the reason why E and F are better is the time of planting and not the compost.

Cotton.

The average yield of seed cotton (all grades) obtained at the *mphala* station was rather less satisfactory this season at approximately 259 lb. per acre or 78 lb. per acre less then the average yield obtained in 1934. It is thought that this drop in yield is due to the seasonal factor as well as to the new and unacclimatised seed which was put to general use in place of the locally grown seed of U4 mixed bulk.

Time of Planting.– The results of this trial continue to provide significant figures in favour of early planting. The difference between the yields obtained to the several planting dates is perhaps less strikingly evident than formerly but this is only in accordance with normal expectation in a season of unusual rainfall. The latter was heavier than that of last season by no less than 6.68 inches and with 13 more rain days than occurred in 1934.

Now that sub-soil moisture reserves will have been re-built up, it can be anticipated that differences in yields between early and late plantings will be less marked and this may be expected to continue until the former become partially exhausted and the rains again fall to a lower average.

(*a*) *Time-of-planting trials—Yield in lb.—seed cotton*

	Planting date	Treatment totals
A.	3 December	175.75
B.	22 December	205.5
C.	5 January	190.25
D.	26 January	163.5
E.	16 February	153.25
F.	3 March	118.0

z for this experiment = 0.6532: 5% value of z = 0.4783.
Standard error of one plot = 6.42 lb. = 22.9% of mean. Significant difference (P = .05) between totals of 6 plots = 46 lb.

Therefore B is better than E and F.

(*b*) *Combined spacing and time-of planting trial*

Treatment	Planted		Spaced		Treatment totals
D.1	5 December	...	3′ × 1′	2 plts ...	70.25
D.2		...	3′ × 2′	4 plts ...	60.0
D.3		...	3′ × 3′	3 plts ...	70.25
J.1	8 January	...	3′ × 1′	2 plts ...	71.0
J.2		...	3′ × 2′	4 plts ...	68.5
J.3		...	3′ × 3′	3 plts ...	74.75
F.1	6 February	...	3′ × 1′	2 plts ...	72.0
F.2		...	3′ × 2′	4 plts ...	62.25
F.3		...	3′ × 3′	3 plts ...	71.0

Treatment		Totals		Treatment		Totals
D	=	200.5	...	1	=	213.25
J	=	214.2	...	2	=	190.75
F	=	205.25	...	3	=	216.0

The experiment is not significant by the z test.

Standard error of one plot = 3.75 lb. = 21.8% of mean.

It will be noted that the planting dates of this trial correspond about to A, C and E treatments in the time-of-planting trial which it will be noted gave no significance between these three particular dates.

Cotton Strain Trial.—No figures of significance were obtained.

Strain			Grand total
C.28	...	...	84.0
N.3	...	...	89.75
N.10	...	...	86.0
Z.14	...	...	108.0
U-4-42	...	...	107.5
U-4-2	...	...	92.75

z for this experiment = .2932 : 5% value of z = .4986.

Standard error of one plot = 4.31 lb. = 27.3% of mean.

Cotton Stainer Infestation Records.—This work was conducted in collaboration with Mr. Hoyle, Assistant Cotton Specialist to the Empire Cotton Growing Corporation. For the purposes of these records twenty small units were arranged symmetrically over the field in echelon. By this arrangement five composite samples each of four units were provided. Collections of stainers from each plot or unit were made weekly and no attempt was made at collections from the rest of the field. The period March 3rd to September 30th was covered and separate counts of each species collected were duly recorded under their relative composite sample heads. The figures show so pronounced a rise and fall of *Dysdercus intermedius* in the month of May as to suggest that only a small proportion of the population was bred in the cotton field and that the increase was influenced by a migration of the insects from the bush where their food plants had become so dried up as to be less palatable for them than the more succulent cotton plant. It is possible that earlier observations made at the station relating to this subject may be of interest. Commenting upon the proportion of stained cotton obtained to the different planting dates in the trial of 1934 the following expression of opinion was put forward . . . "It is believed that the earlier crop breaks before the incidence of stainer attack has reached its zenith . . . that there is a noticeable progressive increase of the insect as the season advances which is doubtless due to the ease with which the pest is able to feed. It is suggested that seasonal conditions provide comparative studies of the insect metamorphosis for it is suspected that the former must make appreciable differences to the length of the larval period." In the case of *Dysdercus fasciatus* it was found that the numbers increased more gradually and reached their peak somewhat later in the season.

Food Crops.

Work in connection with food crops continues. It has become increasingly evident from the results obtained that particular value attaches to a 2-course rotation of a short-age millet intercropped to cotton and followed in the next season by a short-age millet under or after-cropped to pulses (*Vigna* or *Dolichos* spp.). The comparative value of (*a*) treating the pulse crop as a green manure or (*b*) allowing it to be harvested is now receiving attention. Should the latter course prove to give the degree of satisfaction it is believed will be obtained, then the native agriculturist would be more readily influenced to its adoption as the digging of the crop in green would appeal to the majority as an unnecessary waste of food as well as of time and energy.

In the mixed cropping of cotton with other crops a combination of the latter with gram may offer promise. Cotton with groundnuts is not altogether satisfactory. The growing of cotton in combination with a long-age sorghum had been proved a failure already, but it was mentioned in the report for 1934 that the effect of substituting a short-age sorghum would be given a trial. It was found that cotton in this case was able to make a fair show when so cropped and further observation will be conducted.

Frank Barker,
Agricultural Officer.

Zomba Experimental Station.

Work on the experimental station has continued as heretofore with the addition of larger plantings of pasture plants, *arabica* coffee, fruit trees and *montana* tung oil. The herd of cattle has improved greatly during the year largely owing to better housing and grazing and the birth of greatly improved calves. They have taken their due place in the economy of the station and large quantities of good compost were made during the year, both during the rains and during the dry season. The irrigation canal now constructed has been of great use for the latter purpose and for experimental work with irrigated citrus, coffee and winter cereals.

Extensions of land under cultivation and pasturage were made as a result of aquisitions by Government and the consent of the Conservator of Forests to set aside 500 acres of the Zomba mountain reserve. Thanks are due to him for his help and for marking off this area above the old Naisi road in which no trees will be cut down. The land will be ridge-terraced and fires rigidly kept out. Trials will be made with introduced pasture grasses and careful observation on the effects of grazing and trampling on the natural herbage, especially the *Hyparrhenia* spp. There are of course some good grazing grasses already present on the better soils in the open woodland and high-grass low-tree savannah. Such are *Panicum maximum*, *Pennisetum purpureum*, *Brachiaria brizantha*, and *Melinis minutiflora*. A complete collection of grasses has been made by Mr. A. B. Cormack who is in charge of the station and the specimens will be taken to the Royal Botanic Gardens, Kew, for identification.

Buildings have been added to during the year, and, from the funds of the Native Tobacco Board, a house has been provided for Mr. Cormack. Good houses have also been provided for capitaos employed on the station and better accommodation has been given to men in training. Accommodation for cattle carts and implements has also been improved.

The following capitaos were trained during the year:

In compost manufacture and ridge-terracing	8
In compost manufacture only	7
In ridge-terracing only	2

Most of these men were afterward sent out for work in the field under the supervisors of the Native Tobacco Board in the Southern Province. Five proceeded to tea estates in Mlanje.

As a result of the work on the station during the last ten years, it is possible to state with some confidence the methods which native cultivators must adopt to keep land in the highly-populated semi-humid regions of the Shire highlands in a reasonable state of fertility which will ensure good crops of maize, soya and other beans, and such economic crops as tobacco and tung oil which are possible for them to grow with the prospect of a reasonable return. The type and spacing of ridge terraces for minimising erosion, the inclusion of leguminous and cover crops to the best advantage in the rotation, and the preparation of organic manures such as Indore compost have been the subject of much study and thanks are due to Mr. Cormack for his great help in all this work.

Extension work amongst native cultivators has been carried on with the help of Messrs. Cormack and Smithyman, the latter being particularly engaged in Zomba and the Upper Shire districts in assisting native growers to produce a type of leaf tobacco which has found favour in the West African markets. Nurseries have been sown at Simulu, Naiwali and on the station, and growers have drawn a large number of plants of tobacco of the types required. Some 200 acres of native gardens have been ridge-terraced and manufacture of rain-watered compost has been started in several native villages. The season of 1934/35 was a particularly bad one in Zomba; the high rainfall of January which was eight inches above the average was very detrimental to crop growth and vitiated the results of some experiments.

Yields of certain crops were less than half those obtained in the average year, as can be seen from the following table:—

Crop	Yield per acre in lb.
Maize: yellow Honduras	840
Maize: small flat white	1,250
Groundnuts	540
O-too-tan soya bean	2,000
Yellow varieties of soya	360-750
Buckwheat	600
Oats	1,500
Pigeon pea	840

On account of the acquisitions of land, the station will receive a complete new lay-out in 1936 with the exception of some plots under permanent crops. Many of the manurial and rotation experiments will therefore reach their conclusion, but the yields of dark tobacco in two important rotation experiments will be obtained before the lay-out is re-arranged.

It is proposed therefore that the publication of the results of the 1935 season should be deferred. A complete review of the work of the station will be published at the end of the 1936 season.

A large number of visitors was taken round the station during the year.

In conclusion I should like to express my thanks to the acting Chief Veterinary Officer, Capt. J. M. Culhane, for advice and help in cattle management, particularly in the treatments for the removal of intestinal parasites with which all young stock in Nyasaland are infested.

A. J. W. Hornby,
Assistant Director of Agriculture and Chemist.

Lilongwe Experimental Station.

The main station at Likuni has an area of 350 acres and the Chimvua sub-station an area of 750 acres. The following table shows the area under cultivation.

	Crops	Trees	Total
Likuni ...	55 ...	20 ...	75
Chimvua ...	34 ...	— ...	34
			109

A 10-acre clearing was opened at Chimvua during the year and two 10-acre clearings at Likuni, one of which was opened on behalf of the E.C.G.C. for cotton trials. A 5-acre field at Likuni was temporarily abandoned; an old field was squared and the discarded edges planted to trees. Four more experimental blocks were laid out at Likuni, bringing the total to eight blocks, and a start was made with four blocks at Chimvua. All fields which require it have been ridge-terraced and drains put in wherever necessary so that all rain water is now under control.

Attention was given to the feeding of the live stock which the station now possesses, viz., one Friesland bull, fifteen cows and eight calves with a probability of two more calves being born before the end of the year. Sweet potatoes, maize, soya and other foodstuffs were fed to the cattle which consequently looked sleek and well, although prior to the rains their condition fell away somewhat owing to the almost entire lack of any bush feed. An attempt was made to make hay but rain falling on the stack before it was thatched caused it to be rather unpalatable. Much time was given to the manufacture of compost and it is interesting to find in the latest methods devised at Indore that their experience has induced them to modify their original rather complicated process on the same lines as have been found desirable here. The long period of drying winds in the dry season makes it almost impossible to keep the stacks moist by the application of water.

A commencement was made in laying out the compound for labour on the lines of a model village and latrines were dug for all labour. Four two-roomed huts of *pisé-de-terre* were erected at a cost of £1 each. No instruments or extraneous aids were employed so that the practicability of the erection of such dwelings by unskilled labour should be visible to all.

Cotton trials are to be extended under instruction from the E.C.G.C., and, as 30 acres will eventually be required, an office and store building was erected for the Corporation on the main station.

The planting of windbreaks round all fields has been undertaken and also avenues along the main roads. Plantations have been made in various places. A small plot for providing pasturage for the livestock has been commenced and it is intended to endeavour to get wooly finger grass, pearl millet and sorghum established.

Experimental Work.

Drought conditions prevailed during seven weeks of the habitually short growing season of the Lilongwe district. From January 25th to March 15th there was only ½ in. of effective rain and this fell on February 10th. All crops suffered in consequence and poor yields were general.

Potash Experiment with dark-fired tobacco, 2nd year, Latin square.

Plot.	Treatment. lb. per acre		Mean yield (green leaf). lb.
A	groundnut cake	300	
	wood ash	200	3,850
B	wood ash	300	3,630
C	muriate of potash	45	2,995
D	control	... ...	2,860

Differences are not significant. This negative result corresponds with that of the first year's result.

Organic Manure Experiment with dark-fired tobacco, 2nd year, randomised block.

Plot.	Treatment.	Mean yield per acre (green leaf).
		lb.
A	interplanted soya	2,247
B	compost (5 tons per acre) ...	3,403
C	control	2,100
D	cotton seed (1,000 lb. per acre) ...	3,013
E	groundnut cake (1,000 lb. per acre) ...	3,157
F	farmyard manure (5 tons per acre) ...	3,293

Treatment differences are significant.

B yields better than all treatments except F.
F yields better than A, C, and D.
D and E yield better than A and C.
A yields better than C.

This compares with the results of the first year experiment on new land when no results were significant.

No. 1 Rotation Experiment, 2nd year, Latin square.

Plot.	Previous crop.	Present crop.	yield. lb. per acre.
A	fallow ...	fallow	—
B	sunnhemp (dug in)	finger millet (not burnt over) ...	611
C	groundnuts ...	maize and organic matter	2,997 (unshelled)
D	pigeon pea ...	pigeon pea	nil
E	sunnhemp (not dug in)	finger millet (burnt over)	1,006
F	pigeon pea ...	pigeon pea	nil
G	fallow ...	fallow	—

Differences between millet yields are not significant. Dry conditions made a good stand impossible.

No. 2 Rotation Experiment, 2nd. year, Latin square.

Plot.	Previous crop.	Present crop.	Yield. lb. per acre.
A	fallow ...	tobacco	3,640
B	control tobacco	control tobacco	2,687
C	soya ...	soya	240
D	sunnhemp dug in	maize	2,240 (unshelled)
E	pigeon pea	pigeon pea	nil
F	cowpea ...	maize	1,287 (unshelled)

The soya crop was damaged by doves when sprouting and ants when stooked. Tobacco following fallow was significantly better than control. Maize plus organic matter in No. 1 rotation experiment is significantly better than maize after sunnhemp dug in, and the latter is better than maize after cowpeas cropped.

Crop Observations.

The following in tabulated form are the results of observations on various crops.

Good Results.

Crop	Variety	Remarks (yields in lb. p.a.)
Tobacco	Hickory Pryor, Cash, Golden Dollar	All gave yields of over 900 lb. cured leaf on light sandy soils (*nsanga*). Side dressings of 50 lb. of sulphate of ammonia.
	Turkish	As above with yield of 450 lb.
	Dark Nyasa	Grown for seed.
Groundnuts	Local	Gave good yield, but, if grown on heavier soils, cost of harvesting is prohibitive.
Maize	Potch. Pearl	Yield of over 2,240 lb. grain.
Beans	Velvet	Yield of 1,112 lb.
Soya	Ootootan	Badly attacked by doves when sprouting. Yield of over 1,000 lb.

Finger millet	*kangumba*	Grows freely. Yield 2,000 lb. grain. Should be transplanted.
Canna	edible	Stands drought well; no yield yet available.
Sweet potatoes	Early Butter	6,007 lb.
	Linslade	4,663 lb.
Grass	Woolly finger	Grows slowly but stands drought well.
Indigofera	*endecaphylla*	Grows well but dies in dry season.
Loofah	*L. cylindrica*	Grows well and bears freely.

Promising Results. For further trial.

Maize	Anveld	Early maturing; susceptible to weevil.
Soya	Herman	Promises to be a good yielder. Seed only rarely discoloured.
	Barberton Yellow	Yields less than Herman with proportion of green-coloured seed.
Finger millet	*kafumbata & mtanga*	Both give good yields but less than *kangumba*.
Cotton	Various	Shows promise; trial to be continued.
Wheats	do.	Promising on light sandy soils.
Oats	Algerian	Promising on light sandy soils.
Cassava	local	Fair yields on sandy soil; attacked by porcupines.
Tung	*A. montana*	Promising.
Buckwheat		Promising; selfsows readily.

Poor Results.

Pigeon pea		Gives no yields except on anthills.
Pyrethrum	vars (2)	Has not flowered after two years.
Castor	local	Yields well only on antheaps or as single-plant stands.
N. Z. flax		Did not survive two dry seasons; may thrive beside water.
Bananas	various	Adversely affected by cold and frost.
Pawpaw	local	Yields insipid fruit and cut back by frost.
Sunnhemp		Very susceptible to beetle attack; gives very poor seed yield.
Chickory		No germination.
Beans	Tepary	Gives low yields only.
	Lima	Gives low yields only.

Indecisive Results. For further trial.

Sorghums	various	Birds destroyed all seed.
Maize	Honduras Yellow	Produces hard weevil-resistant seed but has not given high yields.
Soya	Biloxi	Low yield.
	Midwest	Low yield and proportion of discoloured seed.
	Yellow Mammoth	As above; proportion of discoloured seed higher.
Cowpea		One high yield of 930 lb. obtained on new land.
Rices	various	Should give good yields if first sown in nurseries at beginning of November.
Pearl millet	vars. (2)	Seriously attacked by birds and *Cerebella* disease.
Sunflower	black	Gives fair yield and is fairly drought-resistant.
	white	Very poor yield in first year of trial; damaged by drought.
Sugarcane	Uba	Damaged by frost; matures very slowly.
Proso millet	various	Destroyed by locusts.
Broomcorn		No reliable results yet obtained.
Barley		No reliable results yet obtained.

R. M. ANTILL,
Agricultural Superintendent, Native Tobacco Board.

Mlanje Experimental Station.

Routine.—The plucking, pruning and manurial experiments were continued on the Ruo Estate experimental plots.

Tea Seed Storage.—The method of storing tea seed discovered by Mr. R. C. MacGrath, manager of Bandanga Estate, Cholo, and mentioned in the annual report for 1934 was tested at the station in 1935 under controlled conditions. The results were eminently successful and showed that the method may be adopted with ease by those planters who favour planting seed-at-stake. The method has been fully described in a bulletin submitted for publication.

Bent and Twisted Tap Roots.—A careful examination of a number of small seedlings followed up by certain experimental work has shown that nearly all the remarkable twists and bends found in nursery plants, when dug up for planting, are caused by mechanical obstruction to the earliest root and shoot growth of the seedling offered by the hard outer testa of the tea seed. To obtain the straightest roots it has been found that the seed should be planted with the hilum (eye) pointing sideways. The subject is also discussed fully in the bulletin mentioned above and a routine schedule for tea seed management has been submitted. The importance of obtaining straight-rooted plants is obviously of greater importance in seed-at-stake planting because in using any other method of planting there is an opportunity to rogue out the plants with bent roots.

Planting Experiment.—The commonest method of planting tea in Nyasaland is with the use of one and a half year-old stumps. Until now the efficacy of this method has depended entirely on climatic conditions. Methods to overcome this difficulty were tested in the 1934-35 planting season. Unfortunately from the experimental view-point the season was phenomenally suitable for planting throughout so that there was little difference between the methods employed. Only one result of significance was obtained and is of importance in view of the practice of some planters who are in the habit of dipping the roots of the stumps into puddled mud before planting. The only plants which suffered extensively in the experiment were those which had been puddled.

The method of carrying out the experiment was to plant out 40 plants of each treatment on the same day; planting took place every Friday for 12 weeks on end to ensure that the methods would be tested under every available climatic condition. The 40 plants were divided up into four groups of 10 in order to randomize the method to a certain extent. The results below compare the effect of puddling against non-puddled plants. No figures for the other methods are given because they showed no definite difference in the final percentage stand of plants.

Percentage vacancies after six months.

	Planting dates												Mean
	December				January				February				
	7	14	21	28	4	11	18	25	1	8	15	22	
Not puddled	3	0	8	10	13	8	8	5	5	13	3	0	6.3
Puddled day before planting ...	13	13	18	18	25	45	10	13	18	15	18	3	17.4
Puddled day planted ...	10	35	25	25	13	38	15	8	30	8	8	3	18.1

The results show clearly the detrimental effect of puddling the roots. An examination of the roots of other mudded stumps showed that, whereas the non-mudded roots retained their normal healthy colour, the mudded roots developed many longitudinal blackened areas in their bark; these are probably due to heating of the bark caused by the film of mud being impervious to air and thus preventing the normal respiratory processes of the root.

Pruning. A small plot of well-grown bushes planted as six months old seedlings in Februar 1933 was pruned down to varying heights in May 1935. Some treatments were found to have caused a greater proportion of deaths than others, as shown in the following table:—

Height of pruning cut	Percentage deaths after pruning
Ground level	22.3
2 in. above ground	7.4
4 in. „ „	6.4
14 in. „ „	2.8

The greater mortality of the plants pruned to the ground level is probably due to severing of the feeder roots caused by rough treatment during pruning of the thickened base of the plant stems. All plants were pruned with knives. The result is reported here as a warning.

Tea Fermentation. A number of field experiments was carried out on behalf of the Assistant Director and Chemist in connection with the tea fermentation problem which is serious in leaf plucked from certain soils.

R. LEACH,
Plant Pathologist.

Domira Bay Experimental Station
Progress Report for the Season 1934-35.

By H. C. Ducker, W. L. Miller and S. T. Hoyle.

It is impossible to discuss the past season's results without laying great emphasis on the rainfall distribution, though the total was just about up to expectation. The rains broke at the end of November and planting took place in early December under ideal conditions. The cotton grew well till early February when flowering was general, which is about a fortnight earlier than normal. From February 9th there was a drought which was not properly broken till March 17th. The effect of the drought, coming as it did at the period when the cotton should have been setting its main crop, was to turn the normal single-peaked flowering curve with its maximum at the end of March to a double-peaked curve with maxima at the end of February and the end of April, with a very marked trough between them. Though the total number of flowers per acre was not reduced, the final result was to reduce the bulk crop from a normal average of about 250 lb. to 160 lb. lint per acre. Some part of this reduction in yield was due to the drought increasing the amount of natural shedding, but the greater part was due to insect attack, the reasons for which are discussed below.

The bulk fields were all sown with various strains of U-4, the most successful of which was once again the C-28 strain from Barberton. A half-acre increase plot of a local reselection within this strain yielded at the rate of 220 lb. lint per acre in spite of the conditions.

In the breeding block the reselection work within the U-4 strains was continued and some are definite improvements and are being used to replace the existing bulk seed stocks on the station.

There is a varied selection of crossbred material and at present it is only possible to say that some of these show promise. Probably the best of these is the U-4 × Cambodia × U-4 cross. It is interesting to note that there is a distinct difference in plant habit between the progeny of this cross made on the station, now in the F-4 generation, and the seed sent by Dr. Harland, the latter being much smaller and more compact though there seems little difference in their yielding powers. Some of Dr. Harland's crosses with Jamaica Xerophytic in their make up look as if they should be useful in those areas in which a quick-maturing cotton is not a necessity.

Pests.

Locusts.—Small swarms of redwinged locusts first appeared over the station in the last week of November and continued throughout December and the early part of January. Some young cotton plants were eaten and supplying was necessary in a few of the bulk fields. The damage done in the spacing and strain trials was sufficiently serious to render the results from these experiments invalid. Considerable damage was done to the maize on the station and in native gardens in the vicinity. A good deal of egg-laying took place and though some hoppers were hatched out none of these reached maturity. No locusts of any sort were seen on the station after the middle of February. Many of the adults were killed by fungus disease. It is thought that most of the eggs laid were eaten by the larvae of Cantharid beetles. The few hoppers which did hatch out were all killed by a fungus disease or other causes.

Stainers.—As noted above there was more stainer damage this season than there has ever been on the station. This can largely be explained by the February-March drought. The primary migration into the cotton fields began in the same way as last year, but in the dry conditions of the last half of February many of the wild plants, mainly *Hibiscus* spp. which are a favourite food of the stainer, became less attractive than the cotton. The result was that in the middle of April when the rise of the second peak of the flowering curve began, there was a considerable population of stainers in the fields. But for the drought the rise in stainer population would not have begun until flowering was nearly finished. The delayed flowering meant that there was a high stainer-boll ratio especially in the early stages of the crop which Pearson has shown to be the most susceptible time. A very great deal of damage was caused by

stainers though exactly how great a loss in quantity and quality it is impossible to estimate. So far as one can tell from past records the peculiar conditions of last season are not likely to be repeated frequently and no undue concern need be felt because of the results for this reason. It was noticed that some native gardens 15 miles away on which some rain fell during the drought period at the station were not nearly so badly affected.

The course of infestation of *Dysdercus intermedius*, except for a slightly greater initial migration, was similar to last year, rising to a peak of 1,500 adults per acre at the end of May and then falling away rapidly. *D. fasciatus* followed the same course until May and then, instead of falling away, rose steeply to a maximum at the end of June with an estimated population of 4,000 adults and 8,000 V instar nymphs per acre. These high figures, presumably due to the extended flowering period, go far to explain why there was so much staining even though the crop was well advanced when the population peak was reached. Even so it is probable that the greater part of the damage was done in the early stages of the crop. *D. superstitiosus* was found in very small numbers and *D. nigrofasciatus* recorded only twice. At present there is nothing further to add to last year's report on wild host plants.

American Boll-worm. In the past American boll-worm has not been of great importance and always less so than red boll-worm. This year much damage was done and as with stainers the reasons why the damage was greater this year can mostly be put down to the February-March drought. It is highly probable that the past immunity from serious boll-worm damage to cotton, both native-grown and on the station, has been due to the numerous counter attractants, principally maize but also groundnuts, sorghum and other millets. On the station it has been the practice to plant these crops at one time, but in native practice there is a considerable range of sowing date in any area and so there is an extended flowering period when the plants are attractive to the boll-worm moth. This year many of the earlier plantings of maize in the surrounding native gardens were eaten by locusts and the replantings had a smaller range of sowing dates than is usually the case. The drought also reduced the crop and hastened the end of the flowering period, so that taking the district as a whole there was less crop and less time in which maize acted as a counter attractant for the egg-laying of *Heliothis*. So although much damage was done by boll-worm it is thought that it can be largely explained by the peculiar season and that it is not likely to recur frequently.

Sudan boll-worm was present in about the usual numbers. Records of egg-laying and larvae of both American and Sudan boll-worm were made and the numbers recorded seemed to be less than would be expected from the damage done. This may have been due to a high percentage survival or because the native recording staff were not previously experienced in this work. A more elaborate scheme has been drawn up for the coming season.

Rotation Crops.

Most of the rotation crops suffered directly or indirectly from the unusually uneven distribution of rainfall during the growing season. Maize was planted early (end of November) and germination was good, though some damage was done by locusts. The greatest damage however was by white ants during the drought. An enormous number of stalks were damaged or eaten through and the unripe cobs damaged on the ground.

From the native-grown selections 220 rows of 55 yards were planted and from these 35 have been retained for further trial.

Groundnuts only produced some 60 per cent. of last year's yield; flowering coincided with the drought period and the ground became very hard. A Latin square variety trial showed the Barberton strain to advantage both in yield and percentage of shelled nuts. There was little to choose between the station seed and a variety from the Gambia. A closer spacing than was used is indicated for the latter variety and for the Barberton strain. A local native running strain proved later in maturing than the bunch types, and suffered badly from the dry conditions. Beans were practically a failure owing to, first, destruction of the early sowings by locusts, second, attacks by flower-eating Cantharides beetles on the supplies, and thirdly, the drought. Green gram, however, did fairly well in spite of the conditions, and has again proved a valuable crop for the Domira Bay area. Even the pigeon pea (*Cajanus indicus*) has suffered from the drought, and the way in which second-year ratoons have died out during the hot season, October-November, would indicate that the effective rainfall this season was very low, especially towards the end of the season.

Buildings.

Various considerations prompted a request that instead, as was at first intended, the headquarters of the corporation be established at Lilongwe, permission be given for the Cotton Specialist's office, house, and general quarters to be built at Domira Bay. This permission was given and a satisfactory start has been made with the buildings. An admirable site has been found for them on the experimental station, and they should be complete and ready for occupation before the end of the financial year. The house is very similar to that built last year and the office conforms to the other offices and laboratory in its design. A double garage for visitors' cars has been erected, and eight double huts added to the labour lines.

Lilongwe.

Owing to the change in plan for the site of Mr. Ducker's house it has been decided to abandon the idea of a separate sub-station for cotton work near Lilongwe. Instead the Government have granted facilities at the Lilongwe Experimental Station. This has the advantage that if, in the future, it should be proved that cotton is not an economic proposition on the Lilongwe plateau the capital expenditure involved will not be wasted but will be made use of by the existing station. A total of thirty acres has been set aside for experimental work out of which ten acres will be planted with cotton annually.

During the past season the rainfall at Lilongwe was somewhat similar to that at Domira Bay with a marked drought in February-March. In spite of this the results were very much better than last year. There was much less damage due to staining and this may be correlated with the fact that the rains did not continue so late as last year. It is to be expected that there will be even less staining in a year in which the rains carry on till April without a serious break and then finish.

Among the strains tested the introductions from Gatooma were outstandingly good, especially G-4 (14) followed by G-5 (123) and G-5 (79). Some observation blocks of close-spaced cotton (3 ft. by 1ft. with two or three plants per hole) also showed to advantage. This confirms what had been previously thought that there is a greater resemblance in cotton-growing conditions at Lilongwe and Gatooma than between Lilongwe and Domira Bay. A further fact bearing on this is that the type of growth and distribution of *Sterculia* spp. bears a general resemblance to that in Rhodesia. In consequence of this, most of the area under cotton at Lilongwe this year will be devoted to the various Gatooma strains and a new introduction of the parent strain of G-4 (14).

Owing to the amount of staining last year there was a very poor stand among the local selections. Some of these showed up fairly well and about fifty single-plant selections were harvested.

In addition to the plot at the Lilongwe Experimental Station eight European estates, scattered over the Lilongwe plateau, kindly put in observation plots. The results from these were not consistent but one, at least, yielded at the rate of 200 lb. lint per acre and some of the others were distinctly encouraging.

Stainers were counted but, owing to the small area under cotton and the imperfect stand, the quantitative results cannot be considered very reliable. The course of the infestation appeared to follow somewhat the same course as at Domira Bay, starting in March and reaching its maximum in the latter half of May. *Thespesia rogersii* is distributed generally throughout the area and seems to be the commonest perennial host plant. *Sterculia triphaca* and *S. quinqualoba* are not common and when found are usually stunted and growing on rocky outcrops. In addition there are various annual herbs, mainly *Hibiscus* spp., which have not yet been identified.

EUROPEAN AGRICULTURE.

Name of district.	Total acreage under cultivation. Acres.	Tobacco. Total. Acres under crop.	Tobacco. Total. Yield cwt.	Tobacco. *Fire-cured.* Acres under crop.	Tobacco. *Fire-cured.* Yield cwt.	Tobacco. *Flue-cured.* Acres under crop.	Tobacco. *Flue-cured.* Yield cwt.	Tobacco. *Air-cured.* Acres under crop.	Tobacco. *Air-cured.* Yield cwt.	Tea. Acres under crop.	Tea. Yield cwt.	Coffee. Acres under crop.	Coffee. Yield cwt.
Lower Shire ...	165	...	...	..	...	...	...	...	...	...	...	...	...
Chikwawa ...	198	105	446	...	..	*100*	*416*	*5*	*30*	..	..	10	13
Central Shire ...	339	230	793	...	.	*230*	*793*	...	...	...	...	...	...
Cholo ...	15,722	1,277	2,977	*40*	*160*	*1,237*	*2,817*	...	...	7,474	9,292	308	213
Mlanje ...	13,364	834	1,992	*300*	*1,079*	*394*	*634*	*140*	*279*	8,580	41,875	120	547
Blantyre ...	5,673	900	3,942	*150*	*940*	*750*	*3,002*	...	...	...	...	299	508
Chiradzulu ...	1,953	50	65	*10*	*10*	*40*	*55*	...	..	...	...	...	...
Zomba ...	2,473	548	1,511	*5*	*15*	*540*	*1,487*	*3*	*9*	...	...	15	2
Upper Shire ...	204	82	330	*82*	*330*	...	.	...	...	...	...	...	...
South Nyasa ...	1,492	995	3,309	.	..	*965*	*3,208*	*30*	*101*	...	..	25	..
Ncheu ...	1,529	748	2,322	*382*	*1,385*	*234*	*587*	*132*	*350*	...	...	25	57
Dedza ...	259	...	...			..	.	...	...	...	...	6	3
Fort Manning ...	143	28	70	...	...	*8*	*14*	*20*	*56*	...	...	...	...
Lilongwe ...	2,549	345	1,093	*156*	*514*	*114*	*312*	*75*	*267*	...	...	...	..
Dowa ...	538	2	8	*2*	*8*	..	...	...				...	.
Kota Kota ...	36	...	...	...	..	...	...	...				.	
Kasungu ...	10	...	...	...	.	...	...	...	...	...	...	...	...
Mzimba ...	127	...	...	...	...	..	...	...	..	...	...	102	132
West Nyasa ...	1,305	...	...	...	.	...	...	...	...	...	...	...	...
North Nyasa ...	163	...	...	...	.	...	...	...	...	...	...	85	130
Total ...	48,242	6,144	18,858	*1,127*	*4,441*	*4,612*	*13,325*	*405*	*1,092*	16,054	51,167	995	1,605

NOTE:—TEA: Acreage in plucking 1935 was 12,611. COFFEE: Acreage in bearing 1935 was 732.

EUROPEAN AGRICULTURE—CONTINUED.

Name of district	Sisal. Acres under crop.	Sisal. Yield cwt.	Cotton. Acres under crop.	Cotton. Yield cwt. (lint)	Rubber. Acres under crop.	Rubber. Yield cwt.	Chillies and Capsicums. Acres under crop.	Chillies and Capsicums. Yield cwt.	Maize. Acres under crop.	Maize. Yield cwt.	Wheat. Acres under crop.	Wheat. Yield cwt.
Lower Shire	...	...	83	60	...			...	23	144	..	..
Chikwawa	...	...	29	39	...	...	...	...	24	150		...
Central Shire	...	...	...	...	...	...	...	...	...	...	...	.
Cholo	1,245	.	189	27	...	..	...	..	256	2,504	4	9
Mlanje	...		330	547	...	...	180	301	276	3,875		
Blantyre	..	...	304	255	...	...	12	15	134	1,488	3	2
Chiradzulu	..	...	290	291	...	.	...	....	20	176	...	..
Zomba	...	...	84	60	...	...	82	164	164	3,286	.	...
Upper Shire	...	...	85	97	...	...	...	...			...	...
South Nyasa	...	...	...	...	...	...	...	...	30	300	...	...
Ncheu	...	...	356	264	...	...	...	..	75	970		...
Dedza	...	...	32	39	...	...	...	...	68	580	20	164
Fort Manning	...	...		...	...	..	...	...	...	...	1	6
Lilongwe	...	...	6	2	...	...	1	2	99	810	...	...
Dowa	...	...	234	316	...	...	...	...	30	300	2	10
Kota Kota	.	...	...	...	...	...	...	...	7	40	3	40
Kasungu	...	..	...	..	...	...	...	...	...	...	...	...
Mzimba		...	...	..	...	...	...	...	3	67	...	...
West Nyasa	.	...			1,300	1,428	...	...	...	...	..	...
North Nyasa	...		45	19	.	...	...	...	...	...	...	...
Total ...	1,245	...	2,067	2,016	1,300	1,428	275	482	1,209	14,690	33	231

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	Legumes.							Oil Seeds.					
	Total.		*For food.*		*For fodder*		*For green ma'ng.*	Total.		*For crushing.*		*For food.*	
	Acres under crop.	Yield cwt.	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	Acres under crop.	Yield cwt.	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	*Yield cwt.*
Lower Shire	16	16	*15*	*16*	*1*	...	...	7	3	*2*	*1*	*5*	*2*
Chikwawa	3	6	*3*	*6*	...	...	...	...	...	...	...	...	...
Central Shire	40	...	...	...	...	...	*40*	...	...	...	...	...	...
Cholo	519	5,651	*110*	*5,651*	...	...	*409*	5	8	*1*	...	*4*	*8*
Mlanje	1,015	596	*128*	*396*	*10*	*200*	*877*	...	...	...	...	...	..
Blantyre	356	1,447	*42*	*327*	*60*	*1,120*	*254*	1	...	...	...	*1*	..
Chiradzulu	121	515	*35*	*515*	...	...	*86*	...	...	...	...	...	..
Zomba	466	1,998	*214*	*355*	*67*	*1,543*	*185*	11	27	...	...	*11*	*27*
Upper Shire ...	20	...	...	...	...	...	*20*	...	...	...	...	.	...
South Nyasa	127	40	*4*	*40*	...	...	*123*	...	...	...	...	...	.
Ncheu	31	110	*11*	*110*	...	...	*20*	...	...	...	...	...	..
Dedza	10	75	*8*	*75*	...	...	*2*	1	10	...	...	*1*	*10*
Fort Manning	29	10	*1*	*10*	...	...	*28*	...	...	...	...	...	...
Lilongwe	435	8	*2*	*8*	...	...	*433*	11	44	*5*	*25*	*6*	*19*
Dowa	5	3	*5*	*3*	...	...	...	5	40	...	...	*5*	*40*
Kota Kota	...	...	...	...	...	...	...	...	..	...	...	...	..
Kasungu	...	...	...	...	...	...	...	..	...	...	...	...	...
Mzimba	...	...	...	...	...	.		...	...	...	...	...	..
West Nyasa	3	5	*3*	*5*	...	...	..	2	2	...	...	*2*	*2*
North Nyasa	..	...	...	...	...	...	.	...	...	..	..		...
Total ...	3,196	10,480	*581*	*7,517*	*138*	*2,963*	*2,477*	43	134	*8*	*26*	*35*	*108*

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	Tung Oil.		Fruit Trees.		Nut-Bearing Trees.		Miscellaneous.		Woodland Artificially Established.
	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres.
Lower Shire	...	...	3	...	...	...	...	...	33
Chikwawa	...	...	6	7	...	...	1	2	20
Central Shire	...	...	2	...	...	...	...	...	67
Cholo	188	...	126	42	1	...	3	17	4,127
Mlanje	143	...	207	...	...	...	...	..	1,679
Blantyre	3	...	16	40	...	...	...	...	3,645
Chiradzulu	...	...	4	.	...	...	...	...	1,468
Zomba	5	4	12	21	...	...	29	1,734	1,057
Upper Shire	...	...	1	1	...	...	...	...	16
South Nyasa	...	...	...		...	...	...	..	315
Ncheu	...	...	9	...	...	...	...	...	285
Dedza	...	...	31	133	...	...	...	...	91
Fort Manning	...	...	4	...	...	...	...	...	81
Lilongwe	2	...	6	50	1	...	...	...	1,643
Dowa	...	. .	2	8	...	...	...	...	258
Kota Kota	...	...	1	30	...	...	...	...	25
Kasungu	...	...	...	...	...	...	...	...	10
Mzimba	..	...	...	...	...	...	...	...	22
West Nyasa	...	...	...	...	...	...	...	...	...
North Nyasa	...	...	...	...	...	...	...	...	33
Total .	341	4	430	332	2	...	33	1,753	14,875

NATIVE AGRICULTURE.

District.	Seed Cotton	Rice	Wheat	Ground-nuts	Tobacco	Maize	Peas and Beans
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Lower Shire ...	3,776				...		
Chikwawa ...	3,079				..		
Central Shire ...	466				...		
Cholo ..	649				13		
Mlanje ...	383				300		
Blantyre ...	148				107		
Chiradzulu ...	23				443		
Zomba ...	23				185		
Upper Shire ...	135				14		
South Nyasa ...	241				...		
Ncheu ...	361				103		
Dedza ..	569				1		
Fort Manning ...	...				173		
Lilongwe ...	...				2,038		
Dowa ...	1,166				1,217		
Kota Kota ..	178				...		
Kasungu ...	...						
Mzimba ...	...				...		
West Nyasa ...	...				...		
North Nyasa ...	49				...		
Total	11,237				4,594		

NOTE.—Maize is the staple foodstuff in most districts; groundnuts, rice, wheat, beans and various other crops are also grown by natives for local consumption, but it is impossible to make an accurate estimate of the quantities of any of these crops.

The above tobacco and cotton figures represent the quantities purchased in each district, and do not accurately reflect the production by districts, as many natives grow their tobacco and cotton in one district and sell in another.

NATIVE LIVE STOCK.

District.	Cattle.	Sheep.	Goats.	Pigs.
Lower Shire	120	2,311	11,561	9,614
Chikwawa ...	*177	*1,385	*7,204	*2,023
Central Shire	1,053	497	4,916	278
Cholo	153	1,915	6,750	5,942
Mlanje	618	2,892	13,201	8,207
Blantyre	2,283	1,228	10,857	4,338
Chiradzulo	2,088	814	7,492	3,889
Zomba	1,240	845	1,312	327
Upper Shire	108	3,098	7,439	459
South Nyasa	267	2,539	3,982	—
Ncheu	*16,215	*4,500	*27,500	*6,500
Dedza ...	22,847	6,338	36,261	825
Fort Manning ...	1,728	3,480	8,760	4,060
Lilongwe	*39,200	*7,000	*51,000	*3,700
Dowa	17,900	7,800	37,900	4,850
Kota Kota	2,900	2,500	11,050	2,450
Kasungu	1,780	1,718	1,369	70
Mzimba	58,388	4,875	18,860	189
West Nyasa ...	2,192	136	1,105	—
North Nyasa	49,220	215	1,819	19
Total	220,477	56,086	270,338	57,740

*1934 figures; 1935 figures not available.

LIVE STOCK OWNED BY EUROPEANS AT 31ST DECEMBER, 1935.

District.	Cows and heifers.	Bulls.	Oxen.	Calves.	Pedigree cattle.	Horses.	Mules.	Donkeys.	Sheep.	Goats.	Pigs
Lower Shire	1,072	25	290	365	1	...	...	...	157	65	69
Chikwawa	261	7	81	80	...	...	...	16	...	...	...
Central Shire	17	2	18	12	...	...	...	2	...	...	...
Cholo	1,151	43	755	616	7	...	...	26	184	22	130
Mlanje	1,287	31	1,010	562	3	...	...	5	177	24	10
Blantyre	1,524	26	780	484	42	6	...	14	...	...	113
Chiradzulo	625	15	332	279	5	3	...	4	29	15	73
Zomba	1,108	18	823	381	18	15	...	23	149	20	78
Upper Shire	8	1	4	4	...	...	...	...	26	95	16
South Nyasa	37	2	20	12	...	...	...	...	15	131	...
Ncheu	230	13	152	147	2	...	...	6	50	34	59
Dedza	294	10	251	204	6	...	...	39	215	12	148
Fort Manning	72	6	80	38	...	...	...	..	71	...	8
Lilongwe	255	12	205	100	8	...	...	29	48	53	146
Dowa	16	...	11	5	...	...	...	...	100	40	4
Kota Kota	35	...	15	5	2	...	...	3	61	...	...
Kasungu	...	...	...	...	...	...	...	...	4	...	4
Mzimba	24	2	33	11	...	...	...	4	9	...	55
West Nyasa	10	5	7	5	...	...	...	...	12	...	22
North Nyasa	110	4	86	42	...	...	...	...	32	...	32
Total ...	8,136	222	4,953	3,352	94	24	...	171	1,339	511	967

Native Tobacco Board.

STATEMENT OF RECEIPTS AND PAYMENTS, 1935.

RECEIPTS				PAYMENTS			
BALANCE BROUGHT FORWARD FROM 1934 ...		£15.372 4 3		BALANCE BROUGHT FORWARD FROM 1934 (TREASURY ACCOUNT)		£288 11 10	
Revenue 1935				*Personal Emoluments: European Staff*			
Tobacco Tax	£8,703 11 6			Secretary	£50 0 0		
Sale of Tobacco Seed to Natives ...	2,552 5 6			Agent and Senior Supervisor	600 0 0		
Sale of Tobacco Seed to Europeans ...	38 15 4			Agricultural Superintendent	550 0 0		
Sale of Tobacco Leaf	56 10 5			Supervisors, 8 @ £400	3,166 13 4		
Sale Miscellaneous Seeds and Plants ...	8 7 5			Temporary Supervisors, 4 @ £360 ..	1,440 0 0		
Sale of Tobacco Booklet	19 9			Temporary Supervisors, 3 for one month @ £25 per month	75 0 0		
Sale of Plants and Gardens Booklet ...	16 10 9			Clerk	320 0 0		
Interest on Fixed Deposits	140 0 0				6,201 13 4		
Miscellaneous Receipts	16 13 0			*Native Staff*			
TOTAL REVENUE		11,533 13 8		14 Clerks, rates and periods variable, £3 to £24	80 11 0		
ADVANCES RETURNED		348 13 8		One hundred and seventy-seven Capitaos, rates and periods variable, £4 16 to £18	1,627 14 11		
				Ten Watchmen, 9 @ £4 16/- and 1 @ £5 2/-	38 14 0		
				Two Messengers, £6 12/-	8 5 0		
					1,755 4 11		
				TOTAL PERSONAL EMOLUMENTS ...		7,956 18 3	
				Other Charges			
				Travelling	1,470 0 7		
				Passages	228 17 1		
				Buildings, Lilongwe—Upkeep of ...	31 0 10		
				Seed and Experimental Plots, Mtiti ...	40 13 9		
				Seed and Experimental Plots, Capitaos ...	48 16 0		
				Lilongwe Experimental Station ...	278 3 1		
				Stationery and Printing	193 14 5		
				Implements and Equipment	9 12 2		
				Incidentals	24 9 3		
				Uniforms	96 6 7		
				Camp Equipment	9 2 0		
				Mapping Materials	15 9 8		
				Tobacco Leaf, packing and shipping of etc.	15 0 5		
				TOTAL OTHER CHARGES		£2,461 5 10	
				Contributions			
				Zomba Experimental Station	293 6 11		
				Nyasaland Government—Clerical Assistance	186 0 0		
				European Police Officer—Travelling ...	38 15 0		
				TOTAL CONTRIBUTIONS		518 1 11	
				Central Buying Stations			
				Permanent Station Hands	19 10 0		
				Sanitation	13 2 6		
				Erection, Enlargement, Repairs and Clearing	125 16 7		
				Survey Fees	25 0 9		
				TOTAL CENTRAL BUYING STATIONS ...		183 9	
				West African Market			
				Travelling	106 4 5		
				Quarters for Capitaos	9 6 0		
				Capitaos	36 15 4		
				Tobacco Seed	38 7 6		
				Implements and Equipment	48 19 2		
				Tobacco Nurseries	121 6 11		
				Zomba Central Buying Station, Erection, etc.	31 5 5		
				TOTAL WEST AFRICAN MARKET ...		392 4	
				Special Expenditure			
				Tents	£192 2 9		
				Pedal Cycles	18 10 0		
				House (including furniture) on Zomba Experimental Station	381 6 8		
				TOTAL SPECIAL EXPENDITURE		591 19	
				TOTAL EXPENDITURE		12,392 11	
				ADVANCES MADE		551 19	
				BALANCES CARRIED FORWARD TO 1936			
				Current Account at Bank	7,070 12 10		
				Fixed Deposits at Bank	7,000 0 0		
				Treasury	239 8 0	14,310 0 1	
		£27,254 11 7				£27,254 11	